


Fourth Annual Report

COMMISSION OF CONSERVATION

CANADA

1913



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Commission of Conservation

*Constituted under "The Conservation Act," 8-9 Edward VII, Chap. 27, 1909;
and amending Acts, 9-10 Edward VII, Chap. 42, 1910; and
3-4 George V, Chap. 12, 1913.*

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HON. CLIFFORD SIFTON

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MR. FRANK DAVISON, Bridgewater, N.S.
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MR. EDWARD GOHIER, St. Laurent, Que.
DR. JAMES W. ROBERTSON, C.M.G., Chairman, Royal Commission on Industrial Training and Technical Education, Ottawa, Ont.
SIR SANDFORD FLEMING, K.C.M.G., Ottawa, Ont., Chancellor, Queen's University
HON. SENATOR WILLIAM CAMERON EDWARDS, Ottawa, Ont.
SIR EDMUND B. OSLER, M.P., Governor, University of Toronto, Toronto, Ontario
MR. CHARLES A. MCCOOL, Ottawa, Ont.
MR. J. F. MACKAY, Business Manager, "The Globe," Toronto, Ont.
DR. B. E. FERNOW, Dean, Faculty of Forestry, University of Toronto, Toronto, Ont.
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HON. W. J. ROCHE, Minister of the Interior, Ottawa
HON. LOUIS CODERRE, Secretary of State and Minister of Mines, Ottawa
HON. JOHN A. MATHIESON, K.C., President, Premier, and Attorney General, Prince Edward Island
HON. ORLANDO T. DANIELS, Attorney General, Nova Scotia
HON. JAMES K. FLEMMING, Premier and Surveyor General, New Brunswick
HON. JULES ALLARD, Minister of Lands and Forests, Que.
HON. WILLIAM HEARST, Minister of Lands, Forests and Mines, Ontario
HON. JAMES H. HOWDEN, Provincial Secretary, Manitoba
HON. JAMES A. CALDER, Minister of Education, Provincial Treasurer and Minister of Railways, Saskatchewan
HON. ARTHUR L. SIFTON, Premier, Minister of Education, and Provincial Treasurer, Alberta
HON. WILLIAM R. ROSS, Minister of Lands, British Columbia

Assistant to Chairman and Deputy Head :

MR. JAMES WHITE

Commission of Conservation Canada

HON. CLIFFORD SIFTON, Chairman

JAMES WHITE, Assistant to Chairman

REPORT OF THE FOURTH ANNUAL MEETING

HELD AT OTTAWA

JANUARY 21-22

1913



Toronto
Warwick Bros. & Rutter, Limited
1913

OTTAWA, March 29, 1913

SIR:

I have the honour to transmit herewith the Fourth Annual Report of the Commission of Conservation. This contains a report of the proceedings of the Fourth Annual Meeting, held in Ottawa on January 21-22, 1913, in which is included summary statements of the work done under the various committees of the Commission, during the fiscal year ending March 31, 1913.

I have the honour to be

Sir

Your obedient servant

JAMES WHITE

Assistant to Chairman

HON. CLIFFORD SIFTON

Chairman, Commission of Conservation

TO FIELD MARSHAL, HIS ROYAL HIGHNESS PRINCE ARTHUR WILLIAM
PATRICK ALBERT, DUKE OF CONNAUGHT AND OF STRATHEARN,
K.G., K.T., K.P., &C., &C., GOVERNOR GENERAL OF CANADA

MAY IT PLEASE YOUR ROYAL HIGHNESS:

The undersigned has the honour to lay before your Royal Highness the Fourth Annual Report of the Commission of Conservation for the fiscal year ending March 31, 1913.

Respectfully submitted

CLIFFORD SIFTON

Chairman

OTTAWA, March 30, 1913

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UTILIZING WASTE LAND IN QUEBEC

There are thousands of acres of hilly and rocky land in Canada fit only for sheep pasture. Too often it lies unused.

PROCEEDINGS
OF THE
FOURTH ANNUAL MEETING
OF THE
COMMISSION OF CONSERVATION
HELD AT
OTTAWA, JANUARY 21 AND 22, 1913

THE Fourth Annual Meeting of the Commission of Conservation was held in the Lecture Hall, Carnegie Library, Ottawa, on January 21 and 22, 1913. The morning session opened at 10 o'clock, the chair being occupied by Senator W. C. Edwards.

Tuesday Morning Session

HON. W. C. EDWARDS: In the absence of the Chairman, Hon. Clifford Sifton, I have been asked to preside at this meeting. I regret his absence very much, because I am sure that he would have been greatly interested in the proceedings at this meeting, and I know that my regret is shared by every one present. We all know the merits of Mr. Sifton, and the great efforts he has made in advancing the work of this Commission; we all hope sincerely that his visit to the old country will result in the restoration of his hearing, and that his sphere of usefulness will thus be greatly extended.

The first item on the programme is the address of the acting chairman. I shall not trouble you with any address, for it is entirely unnecessary. At the inception of this Commission, Mr. Sifton made a very important and useful statement respecting its work. In the preceding annual meetings, he has made short addresses, and, really, there is nothing to-day that I could add, even if I were capable of doing so. But I may just say that it must be apparent to everyone interested in this work that the usefulness of the Commission is constantly increasing. In the Committee on Forests, the branch of the Commission with which I am most intimately associated, and of which I perhaps know the most,

the work which has been done in solving merely two large questions, viz., the creation of the Rocky Mountains Forest Reserve and the enactment and putting into effect of legislation to prevent fires caused by railways—these two accomplishments alone have justified the existence of the whole Commission. The Committee on Forests, as will be seen by the proceedings of to-day and to-morrow, has done a very great work for Canada. But I said I was not going to make an address and I shall not do so.

I shall call on the Secretary to read the minutes of the last annual meeting.

DR. J. W. ROBERTSON: As these minutes have been printed in the Third Annual Report and placed in our hands in that form, I move that they be taken as read. Motion agreed to.

THE CHAIRMAN: I shall now call upon Dr. Hodgetts to read the report of the work done during the past year under the supervision of the Committee on Public Health.

COMMITTEE ON PUBLIC HEALTH

DR. HODGETTS said:

The report for the year 1912 records progress in many of the provinces of Canada. During the year, the legislatures of Ontario, Manitoba and Alberta have revised and improved their public health acts, the legislative enactment of the Province of Ontario being perhaps the most advanced public health act in Canada, if not in the British Empire.

District
Health
Officers

The provinces of Ontario and Quebec have adopted the system of district officers of health and, with the great advantages consequent upon an official of the central authority acting in a supervising and executive position, and moving about from municipality to municipality, a great improvement in the sanitary conditions of the people and of their homes is assured.

Pollution of
Waters

The Conference of Provincial Health Officers held in Ottawa on October 12th and 13th, 1910, at the instance of the Commission of Conservation, recommended that the Dominion Government enact a law prohibiting and penalizing the pollution of the waterways of Canada and waters tributary thereto; and that the provinces be requested to give effect to such legislation in order to avoid any conflict of jurisdiction. It was further urged that the several provinces adopt legislation providing for the systematic super-

vision and inspection of water-purification and sewage-disposal plants. During the interval which has elapsed, considerable progress has been made by the provincial authorities along the lines recommended by the Commission. The provinces of Saskatchewan, Manitoba, Alberta and Ontario require that municipalities stop the pollution of streams, rivers and lakes with raw sewage and that they install systems for the treatment of sewage.

As regards the pollution of international waterways, the question has been referred to the International Joint Commission. Two conferences have recently been held, of the representatives of the health authorities of the states and provinces bordering upon the Great lakes, and the representatives of the public health services of the United States and Canada, with a view to arriving at some agreement respecting the determination of the pollution. It is confidently expected that the work will shortly be entered upon and, when definitely determined, that the manner of prevention will subsequently be settled by the International Joint Commission.

In this connection it may be stated that two bills have been presented, one to the Senate, and the other to the House of Commons of Canada, having for their object the prevention of the pollution of navigable waterways by raw sewage. The Commission of Conservation has already made recommendations along the lines of this proposed legislation, but it is impossible to say whether, as a result of the introduction of these two measures, any practical legislation will result. It is, however, satisfactory to note that the Senate has twice passed a bill similar to that now before it, and, on both occasions, there was little or no opposition shown to this very desirable public health requirement.

**Housing
and Town-
planning***

The important questions of housing and town-planning, which were dealt with by the Committee during the past two years, have become live questions in the most important centres of population. In the provinces of Nova Scotia and New Brunswick, the legislatures have passed town-planning acts which may, with advantage, be carefully considered, if not actually followed, by the other provinces of the Dominion. The Legislature of the Province of Ontario at the last session enacted "The City and Suburbs Plans Act" which, as it is not operative in cities of less than 50,000 population, can be considered only as a step toward the passing of a general town-planning act.

* See Appendix I.

The experience of every city is that most, if not all, of the evils consequent upon, and incident to, faulty planning and improper housing have arisen during the period of growth from a village to a city of fifty thousand. In other words, the city of this size is the heir to all the evils due to its chaotic growth during the years which have intervened. And what is more serious, these initial errors are then either insurmountable, or can be rectified only at enormous cost to the rate-payers.

What is wanted in each province in Canada is a town-planning act which is operative as soon as a town site is fixed upon, such an act to be administered along the same lines as the work of the Local Government Board of Great Britain, where the initiative is taken by the health authorities. The supervising authority, in this instance, is composed of a group of men who represent engineering, public health, architecture and municipal law.

Housing Legislation

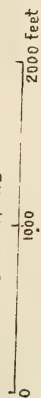
In the matter of housing, the Province of Nova Scotia has passed an act for the Regulation of Tenement Houses and the revised Public Health Act of Manitoba has a series of clauses dealing particularly with this same class of building; while the Province of Saskatchewan has dealt with the question in a series of regulations. It is to be hoped that all the provinces of Canada will, at an early date, have comprehensive laws dealing with these two most important questions of public health, and that they will follow the example set by Great Britain and place the administration of the same with the health authorities and not with any other branch of the provincial service.

During the year, housing and town-planning conferences were held in Winnipeg, Man., and at Berlin, Ont., and, at both conventions, committees were formed having for their object the formation of a Canadian Housing and Town-planning Association. From the interest taken in these two conferences by the municipal authorities of Canada (and, in the former case, the whole Dominion was represented), it is quite

The accompanying diagram shows the plan of Coldbrook Garden City, a proposed model town-site adjacent to St. John, N.B. The area, all under the control of one company, consists of about 600 acres, and houses and other buildings, will be erected on it on the English co-operative plan.

The westerly portion nearest the city of St. John has been set apart for a residential district. Note how the streets depart from the old-fashioned "gridiron" design and follow broad, sweeping curves. The cross streets converge upon a centre where the municipal buildings will be erected. Ample provision has been made for parks and play-grounds. To the south of this district, factory sites have been provided, and one large factory is already under construction. The uplands to the east have been divided into garden plots, varying in size from one to fourteen acres. If necessary, these garden plots may be used later to accommodate the expansion of the residential district.

S^t John, N.B



Note. Areas are subject to revision

evident there now exists in many of our towns and cities an earnest desire for improvement and extension on up-to-date town-planning lines. At the meeting at Winnipeg, which was very large and representative, there was expressed a strong feeling that there should be some national movement in this line. It was felt that, although it was called a national meeting, it was not large enough nor representative enough to be so designated.

National Congress Advised To further stimulate this important branch of public health work and establish it upon sound and practical lines, it would be along the best lines of conservation for this Commission to call a national housing and town-planning congress at Ottawa and secure, if possible, the attendance of one of the officers of the Local Government Board of Great Britain charged with the administration of this particular branch of the Board's work. In this manner, the question would be placed upon a basis which would ensure a co-ordination of work, while the varied interests concerned in this important movement could co-operate with a national association—the Commission of Conservation—with a view to the giving of illustrated lectures upon the question.

Detailed Work of the Year During the year your medical adviser has delivered public addresses on housing, town-planning, infantile mortality, the care of the feeble-minded, tuberculosis and many other public health questions, his itinerary including Edmonton and Calgary in the west to Halifax in the east.

A special report was made, after personal examination, upon the claim of the city of Chicago, Ill., that the waters of Lake Michigan as used and as contemplated to be used by the Chicago Sanitary District, were required for sanitary purposes.

An investigation was made into the outbreak of typhoid fever in the city of Ottawa which occurred during the months of July, August and September of the current year.

During the months of September, October and November your Medical Adviser acted as Medical Officer of Health of the city of Ottawa upon the invitation of the mayor and the approval of the city council. A brief criticism of this important department of the city's work was submitted.

In the month of October your Medical Adviser attended the meeting of the Great Lakes Pure Water Association as a representative of the Government of Canada.

Unified Public Health Service

In conclusion, I would again direct the attention of the Commission to the necessity which exists for the consolidation of all branches of Federal public health work into one co-ordinated Public Health Division with central public laboratories under the supervision of medical, bacteriological, and chemical experts. This organization might well be made a service somewhat along the lines of the Public Health Service of the United States. It is to be noticed with pleasure that the daily press recently stated that the Hon. Dr. Roche, Minister of the Interior, has prepared a bill for the consideration of the Cabinet, which has for its object the main points recommended by this Committee last year.

With such a service properly organized, attention could be directed to the important matter of pure food for home consumption.

Uniform Vital Statistics

Another question of national importance is that of uniform vital statistics. At the present time, Ontario leads in the collection and compilation of these statistics, and the registrations of births, deaths, and marriages covering a period of forty-two years are now separately stored in fire-proof vaults. All these records are carefully indexed and available for public inspection. Manitoba has just published its third annual report on vital statistics, being for the year 1911. This report is a model which might with advantage be followed by other provinces of the Dominion. The Dominion Government in part recognizes the fact that the registration of births, marriages and deaths is a national question in so far as it permits all returns and correspondence to and from the registrar general of each province to pass through the mails free of charge. In view of this concession and in order to secure uniformity throughout the Dominion, it may be well to consider whether some Federal legislation cannot be passed which would unify and co-ordinate this important branch of public health work under a well-organized Federal department of health. This question is one which can, and should, receive immediate attention; for the value of a complete and systematic registration of all births, marriages and deaths is of intrinsic value from a national standpoint.

Immigration Problem

This report cannot be closed without referring to the grave situation which exists in this country as a result of the enormous influx of immigrants who are annually being received into the Dominion. This influx is much greater, proportionately, than was experienced in the United States during the period of maximum immigration into that country.

Slums We have before us the evidence of over-crowding and slums with all their associated evils. We know that these conditions are not being lessened but rather, on the other hand, are being aggravated. We know that greater and commendable efforts are being put forth by social workers in every large centre with the object of securing a mitigation of the evil. What is being done by the state to assist them, in their efforts to care for and assimilate these people, and what is being done along preventive lines to meet a difficulty, if not a calamity, by providing ways and means for the immigrant population? It is essential that the immigrants be properly housed, fed and clothed. They may work to secure the two last-named, but who is to provide the home in which they must live? Under existing conditions, we are damning posterity through the environment into which we are driving this class of our people. Year after year we neglect to provide for their proper housing; and we are piling up for ourselves obligations which, if we were wise and far-seeing, we would prevent. Proper and adequate housing facilities represent the most concrete and most essential element in the control of the health and human efficiency of our people, and legislation which would tend to improve the existing unsanitary conditions is imperative, owing to the constant increase of our population, particularly our foreign population.

As an evidence of the growth of interest shown by the people of Canada in health problems generally, we can point with satisfaction to the Second Congress of the Canadian Public Health Association which convened in Toronto in September last. The attendance was representative of every province of the Dominion and in point of attendance of delegates was far in advance of the inaugural meeting in Montreal. The Congress in 1913 will be held in the city of Regina and there is every prospect that the efforts of the local committee of arrangements will meet with marked success in bringing together in conferences the many and various workers in the different branches of hygiene.

DISCUSSION

Provincial Health Administration HON. O. T. DANIELS: I would like to make one observation in respect to public health. Heretofore, it has been the policy of the provincial governments to try to maintain what has been known popularly as provincial autonomy. Every little field of activity that a provincial government in the past has been able to take within its jurisdiction, it has been pleased to do so. It seems to me, particularly with respect to the Maritime Provinces, that, if there is one thing that we should be rid of, it is the administration of public health work. If there is any subject that should engage

the attention of the Federal Government and should be subject entirely to Federal legislation, that subject is public health. The Maritime Provinces with their limited revenue, have not the money efficiently to protect the health of their people.

The protection of the public health is a work common to the whole country. For instance, tuberculosis, with which we are trying to deal locally in Nova Scotia, is a disease which is carried from one province to another. If there is any subject that this Commission could effectually deal with and assist us with, it is this of the prevention of disease throughout Canada, and the impressing on the Federal Government of the necessity of dealing with the subject of public health.

THE CHAIRMAN: I am familiar with the situation to which you refer. For three or four years I was president of the Canadian Association for the Prevention of Tuberculosis. The great difficulty we experienced was not unwillingness on the part of the provinces to allow the Dominion to assume responsibility, but, to get the Dominion to assume responsibility which they considered devolved definitely upon the provinces as provided by the British North America Act. But a beginning has been made, the Dominion is actually considering it now, and, we hope that, through the instrumentality of this Commission, and, of the Committee presided over by Sir Edmund Osler, that something of benefit to the country will yet be accomplished in this respect.

Town-planning and Housing Expert SIR EDMUND OSLER: A subject to which I would especially like to refer is the strong effort that has been made to get Mr. Thomas Adams, an officer of the British Government in charge of town-planning and housing, to visit Canada. Organizations have been formed in almost all the leading cities of Canada having in view the proper laying out of new towns and the devising of plans to provide sanitary houses for workingmen, a need which is probably one of the greatest of our growing country. A petition asking us to secure Mr. Adams to give advice in these matters has been very largely signed by public bodies interested, and has been forwarded to the Commission. In fact, they have probably taken a little more trouble than they need to have taken, evidently thinking that this Commission would require very strong pressure to be brought on it to induce it to ask for the presence of Mr. Adams, who, being employed by the British Government, cannot come here except by the invitation of the Canadian Government. It is understood that his government would probably give him leave for two months if our government requested it. Of course, we would have to pay his expenses and probably



WORKINGMEN'S HOMES IN ENGLISH GARDEN SUBURB

Note the economical construction of the street—wide boulevards and narrow roadway.



SLUM DWELLERS IN A CANADIAN CITY

These children show the effects of unsanitary housing and faulty nourishment. All three have rickets.

give him some fee. Last week I saw Rt. Hon. Mr. Borden and placed the matter before him. He thoroughly approved of the suggestion and said that, if the Commission made formal request, he would be only too glad to ask the Government of Great Britain to lend the services of Mr. Adams to us.

Petitions asking us to obtain Mr. Adams' services have been sent in by the Canadian Manufacturers' Association, the Canadian Public Health Association, the Order of the Daughters of the Empire, the National Council of Women, the Montreal Parks and Playgrounds Association, the Royal Edward Institution, the Union of Canadian Municipalities, the Montreal Citizens' Association, the Union Committee of Charitable Organizations, Montreal, the Union of Charities of Toronto, the Board of Trade of Hamilton, and by a very large number of the most prominent citizens of Canada. It is suggested that the Commission approve of asking Mr. Adams to come here, and that a small committee should be formed to consult with those in the larger centres who may be interested. We might have Mr. Adams go from Halifax, to New Brunswick, and thence to Quebec, Montreal, Ottawa, Winnipeg and through to the West, probably taking two or three months. The housing question in our cities is, as we all know, a very difficult matter. The cost of land has risen, the cost of building is high and we have not the organization for properly directing the layout of the districts where workingmen's houses should be built. Mr. Adams has spent his life-time at this work and it is thought that a great deal of good would be accomplished if we could get him here. I am inclined to think, however, that those who are very much interested in this question and are very enthusiastic about it, expect a little too much, because conditions in Canada are different from those in Great Britain, and while we will, no doubt, get very valuable suggestions, I doubt very much if Mr. Adams or anybody else can make any suggestions that will reduce the cost of our lands or of our building operations. But, nevertheless, he may give us suggestions that will be very valuable.

I hope the Commission will approve of this suggestion and that it will give authority to ask Rt. Hon. Mr. Borden to invite this gentleman here, and probably appoint a small committee or arrange for some one from each of the provinces to co-operate with Mr. Adams when he comes. There is no doubt that Mr. Adams is a leading authority in this matter. He was invited to Philadelphia to attend the Conference of Civic Planning there in 1911, and he was the one man there who apparently had very sound and business-like ideas on the subject of

housing and town-planning. I do not think I need say anything more on the subject except that I have a very strong letter from Sir John Gibson, the Lieutenant Governor of the Province of Ontario, pressing the matter and hoping the suggestion will meet with the approval of the Commission of Conservation. It is at the instance of the Commission that the invitation should be sent to Mr. Adams, and he should make his visit to Canada under the direction of the Commission.

MR. MACKAY: I do not think it is necessary to add a word to what Sir Edmund Osler has said on this subject. It is a matter the importance of which is realized by every member of the Commission. It is only necessary to travel a very little in the Old Country to see the deplorable conditions in the cities there, and it is only necessary to travel a very little in our own country to see that these conditions are being reproduced here at a rapid rate. The conditions in Canada at the present time are certainly abnormal and unless something is done speedily to check the slums that are growing up in our cities, the conditions will be as bad, if they are not now as bad, in some of the cities of Canada, as they are in London, Glasgow and many Continental cities.

Like Sir Edmund, I think we must not expect too much from the visit of any one man. Mr. Adams may be the most able man we could secure, but we must not expect too much from him; all that can be hoped from the visit of any person is to stir up public interest. He may possibly give a report on conditions in our cities, but that would only be an object lesson for the rest of the country. If, in the course of three or six months, he could go to half a dozen cities and give an illustration, that would form an object lesson to the smaller cities which are rapidly developing the same problems as the larger ones.

I speak for a number of prominent men in Toronto, where I know this matter is felt very deeply, and where many look forward to Mr. Adams' visit as affording a possible solution of the problem. It must be handled carefully and with much patience. The Toronto men who have given thought to this matter, and also Dr. Adams of Montreal, are in accord with the suggestion made, and I am very pleased to hear from Sir Edmund that the Government is prepared to extend the invitation.

I think it essential that Mr. Adams should work in active co-operation with Dr. Hodgetts of the Commission of Conservation. If the Commission is to bear the expense and do a certain amount of organization work, it should be distinctly understood that it is done under the authority of the Commission.

THE CHAIRMAN: I shall now call upon Mr. G. Frank Beer, of Toronto, who has taken an active interest in this subject.

MR. G. FRANK BEER: I think the matter has been so well put by Sir Edmund Osler that there is nothing I could add. We do not expect much, but we do know that Mr. Adams will help us to solve the particular problem we are trying to solve. We believe that Mr. Adams will be able to guide us on points upon which we are seriously disturbed. It is not so much a matter of education; in Toronto, we know the problems before us and we find by correspondence that Calgary, Brantford and other cities, have exactly the same problems.

THE CHAIRMAN: I am sure that the Commission of Conservation will endorse the project. The same subject was put forward by Earl Grey, and, at his instance, Mr. Henry Vivian came to this country and did valuable educational work. If he is followed by Mr. Adams, we may be sure that a great awakening will take place as to the necessity of preventing here the evils that now exist in the cities of the Old Country.

DR. HODGETTS: Mr. Adams is the one man in England who has had to meet with and grapple with the difficulties that we have to-day. He was the man selected by the Rt. Hon. John Burns, to enforce the provisions of the Housing and Town-planning Act in Great Britain, and I am satisfied from what I know of him, that he is a man who will make suggestions and recommendations to the municipalities of Canada, that will be far more practical than those of any other man.

I am pleased to hear what the Attorney-General of Nova Scotia has said in regard to Public Health. Health, as we all recognize, is international. In 1867, when the Dominion was formed, the Fathers of Confederation recognized it as national, but, unfortunately, a few years afterwards, it was turned over to the provinces. The Commission of Conservation is endeavouring to get the Federal Government to establish a Department of Public Health, having central laboratories, with the idea of upholding and stimulating public health work. Possibly, in the near future, we will be able to assist provinces like Nova Scotia in this line of work.

DR. ROBERTSON: I want to point out the need of supplementing the help that the British expert may give us by having him accompanied by a competent Canadian who understands our conditions. The subject is two-fold, housing and town-planning. In my judgment, we, in Canada, know nothing of town-planning—hardly anything—but we do know something about housing. We do not, however, always practise what we know. I had occasion lately to find out how many houses in Ottawa had any provision for ventilation. I could not find more than five, even among the wealthy people, that were

built with intelligent regard to ventilation of bedrooms. In the houses of the poor, where there are double windows, there is no ventilation in the bedrooms. That is a great menace to health; perhaps it is the greatest we have. It would be a great advantage to have some competent man—an engineer or physician—identified with Mr. Adams, to emphasize that part of the subject which touches the workingman.

THE CHAIRMAN: I shall now call upon Mr. W. J. Dick to read the report of the work done under the Committee on Minerals.

COMMITTEE ON MINERALS

MR. DICK said:

I beg to present herewith a brief *résumé* of my work as Mining Engineer of the Commission of Conservation during the year 1912.

The first half of the year was spent in writing a report embodying the results of the investigation on coal mining in Western Canada, which was carried on during the summer of 1911. In order to complete the investigation, visits were made, during the months of June, July and August, to the following coal mines in Nova Scotia:

Coal Mining Report

Mines in vicinity of Sydney Mines:

Nova Scotia Steel and Coal Co., Nos. 1, 2, 3, 4, 5 mines.
Colonial mine.
MacKay mine.

Mines in vicinity of Glace Bay:

Dominion Coal Co., Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 15, 16, 21, 22, mines.

Mines in vicinity of Inverness:

Inverness Railway and Coal Co. mines.

Mines in vicinity of Stellarton:

Acadia Coal Co., Albion mine, Acadia mine, Allan shafts and McGregor mine.
Intercolonial Coal Co., Drummond mine.

Mines in vicinity of Springhill:

Dominion Coal Co. mines.

Visits were also made to coke-oven, coal-briquetting and other plants which have been installed in this province for the more efficient utilization of coal resources. During the earlier period of coal mining in Nova Scotia, considerable waste occurred in the mining and utilization of coal, but, at the present time, owing to the great demand for coal for domestic, power and smelting purposes, the large companies which produce almost the entire output from Nova Scotia, have, as a matter of business, spent large sums of money to effect every economy possible.

The economies effected may be considered under the following operations:

Economies
Effected

1. Mining.
2. Utilization of Coal.

1. MINING.—Under this heading it is necessary, first, to consider how the coal lands are disposed of; second, terms of the leases respecting the methods of mining employed.

Long-Term Leases.—The coal lands are disposed of under a leasehold system, the period being twenty years, (except in special cases), with the option of three renewals, making in all eighty years. Under these conditions, there is little incentive to fevered haste to rob and ruin valuable coal-seams, and more care is exercised in gaining a thorough knowledge of the conditions of coal in its occurrence, before the method best adopted to its extraction is determined upon. The long-period lease also gives confidence to capital and it permits larger preliminary expenditures so that the waste in the mining and utilization of the coal may be reduced to a minimum.

Other advantages of a leasehold system are:

1. The Government obtains a revenue from every ton of coal produced.
2. The Government retains the ownership of the coal areas. This would not be the case if they were disposed of in fee simple.
3. There is a minimum of conflict between holders of surface rights and holders of coal rights.
4. It is not possible for private interests to hold coal lands for speculative purposes, the leases being given for immediate development.
5. The Government has the power to insert clauses in all leases for the purpose of preventing wasteful mining operations and of requiring the operators to give complete information respecting the work.

The method of mining to be adopted in the different localities is generally understood, and, before a mine can be developed or a new

section of a mine opened up, it is necessary that the plans be submitted to and meet with the approval of the provincial Department of Mines. In addition, the Government requires all operators to make yearly returns showing extraction, etc.* The information thus obtained is not only of value in determining the rate of exhaustion of the coal-fields, but also permits a comparison of the methods adopted, thus tending to standardize the methods employed.

As a result of the systematic manner in which mining is carried on in Nova Scotia, large sections of coal have been mined with but very little loss.

With regard to the order in which coal seams are worked, it is the general practice to mine the highest workable seams first and to leave large pillars in advance work to support the weight of the superincumbent strata. Where superimposed seams are worked contemporaneously, the work in the upper seam is kept well in advance of the lower and pillars are never drawn in the lower seam until all the pillars in that section of the upper seam have been removed and the roof has been allowed to settle. Submarine mining is carried on to a considerable extent in Cape Breton, and, with the exception of the flooding of the mine at Port Hood, no accidents have occurred and no coal has been lost.

Generally speaking, few submarine pillars have yet been extracted, but the pillars left are of such dimensions that it will be possible, where sufficient cover exists, to recover these pillars in retreat after the boundaries of the mines have been reached. Where seams of usable size and quality extend seaward beyond the limits of a submarine property, drawing the pillars should be forbidden. If the company's lease does not provide that pillars be left in place, compensation for the pillar coal should be made.

In the Pictou coal-field the conditions are not so favourable for the high extraction of coal as those met with in the Cape Breton coal areas. This is due to the thickness of some of the seams being so great as to make it impossible to mine the whole seam at one lift; also, the high dip of the seams quickly increases the depth of cover over the workings thus making timbering, haulage, pumping and ventilation problems more difficult of solution. To the above, may be added the fact that some of the seams are liable to fires due to spontaneous combustion. Besides, the top benches of the coal seams in several of the mines were removed a number of years ago.

* See Coal Depletion Statement in *Lands, Fisheries and Game, and Minerals, 1911*, pp. 441 and 442.

Notwithstanding the above-mentioned disadvantages, the top coal and the bottom coal which had been previously left in the mine is now being recovered so far as is economically possible.

2. UTILIZATION OF COAL.—Among the economic uses of coal in Nova Scotia may be mentioned:

- (1) The generation of power for mining purposes;
- (2) The coking of coal in by-product coke ovens;
- (3) The briquetting of slack coal; and
- (4) The generation of electrical energy at central power plants for transmission to the surrounding collieries. This has been developed to such an extent that some of the collieries are now operated entirely by electricity. Electric cables are carried underground by means of bore-holes and the energy used for mine haulage and pumping purposes.

These plants present many new and up-to-date features such as low-pressure and high-pressure steam turbo-generators and mechanical stokers for firing the boilers with low-grade slack and splint coal. The Dominion Coal Company has recently installed a power plant at Waterford lake in which Bettington boilers, fired with pulverized low-grade coal, are used to generate steam for the turbo-generators. These boilers are the first of their kind to be installed in America. It is claimed that they will give a higher efficiency than any other boiler on the market.

Coking of Coal.—Practically all the coke produced is made in some type of by-product oven. The Dominion Coal Company recovers the by-products—gas, tar and ammonia. The Nova Scotia Steel and Coal Company recovers only the gas but it is considering the erection of by-product ovens. The coking of coal in by-product ovens is of importance not only on account of the value of the by-products recovered, but also because the briquetting industry is dependent upon the supply of tar or pitch as a binder for the briquettes.

Much slack coal is now produced in mining operations in Nova Scotia and, as the higher grades of coal become less plentiful, lower-grade seams will be worked and more slack coal obtained.

There are, at present, two coal briquetting plants under construction and one in operation in this province. The Dominion Coal Company has purchased the machinery for a briquetting plant, but has not yet decided where it is to be erected.

The report of the investigation on coal-mining in Canada has now been completed and will be published at an early date.

A report entitled *Mine Rescue Work in Canada* has recently been published by this Committee. It was written for the purpose of encouraging the work done by the provincial governments, mine operators and employees, in establishing mine-rescue stations and trained rescue corps at coal mines. It also contains a brief *résumé* of the mine rescue laws in force in the principal coal-mining countries of the world. In this connection, it is of interest to note that the St. John's Ambulance Association has been so organized in Canada as to permit all coal and metal miners taking a course of instruction in first-aid to the injured at very small cost. In British Columbia, the local organizations of this association have already established classes at the different coal mines.

During the past year a number of short reports giving special data relating to the conservation of Canadian mineral resources were prepared on request. Among these may be mentioned those prepared for the International Congress of Applied Chemistry and for the Dominions Royal Commission.

It is the desire of your Mining Engineer that the attention of the Committee on Minerals be directed to certain recommendations which have been made in previous reports with regard to the necessity of bringing the recommendations before the proper authorities in order that action be taken to prevent the possibility of waste which arises under existing laws.

I am pleased to state that during the past year the death rate in mines has been lowered and that more attention has been paid to this branch of conservation.

Owing to the fact that the accidents in metal mines have been largely due to explosives, it is advised that further action be taken to expedite the enactment of the Explosives Bill which has been drafted for the Mines Department but which has not yet become law.

THE CHAIRMAN: I shall now call upon Mr. Clyde Leavitt to read the report of the work done during the year under the Committee on Forests.

COMMITTEE ON FORESTS

MR. LEAVITT said:

Undoubtedly, the two most important accomplishments of the Commission of Conservation along forestry lines in the past, have been the establishment of the Rocky Mountains Forest Reserve and the Government control of the railway fire situation through the amend-

ment of the Railway Act and the issuance of appropriate regulations by the Board of Railway Commissioners.

Aside from the forest survey in Peterborough and Haliburton counties, Ontario, carried on last summer under the direction of Dr. B. E. Fernow, and the conclusion of a study of forest taxation in Canada by Mr. A. Donnell, the principal activities of the Committee on Forests during the past year have been in connection with the various phases of the forest fire problem. The Chief Forester for this Commission was also appointed Chief Fire Inspector for the Railway Commission, and his chief efforts have necessarily been in connection with the field organization of the railway fire work. However, some of the general phases of forestry work have been considered and are covered in the following report. For convenience of discussion and consideration, the report has been divided into several separate sections, as indicated.

THE RAILWAY FIRE SITUATION

1. Lines Subject to the Railway Commission

The issuing of Order No. 16,570, by the Board of Railway Commissioners, May 22nd, 1912, was the beginning of a new era in railway fire protection in Canada.

The origin of this action was the request made in 1909 by the Government of British Columbia that provision be made by the Board for the prevention of forest fires along railway lines in that Province, in addition to the existing requirements for the use of fire-protective appliances on locomotives, which, while essential, were not wholly adequate.

Largely through the influence of the Commission of
The New Legislation Conservation, legislation was secured in 1911 authorizing the requirement of patrols by railway employees; and the Commission was also largely instrumental in drafting and securing the final issuance of Order 16,570.

In addition to the enforced use of fire-protective appliances on locomotives, the non-use of lignite coal, and the construction of fire-guards, contained in previous Orders, the new Order provided for special patrols by railway employees, the inclusion of the whole field force of railway employees in the fire-protective organization; the regulation of the burning of inflammable material along rights-of-way and the extension of the Order to cover the construction as well as the operating period.

This Order goes further in placing upon the railway companies themselves, where it belongs, the responsibility for preventing fires along their lines, than does any similar legislation in the United States or Canada; and it may therefore be said with propriety that Canada has, in this respect, assumed a distinctly leading position on this continent. As to lines in Canada not subject to the jurisdiction of the Board, the requirements imposed upon railway companies as to fire-protective measures are distinctly more progressive in British Columbia, Ontario and Quebec than in the other provinces.

Late in May, the Chief Forester of this Commission was appointed Chief Fire Inspector for the Board, in pursuance of a co-operative arrangement between Hon. Mr. Sifton and the late Chief Commissioner Mabee.

**Organizing
the Field
Force** The organization of the railway fire work was immediately taken up. Conferences were held with railway officials in the West, and with representatives of the Department of Lands of British Columbia and of the Forestry and Parks Branches, Department of the Interior. Letters of instruction were then issued by the Chief Fire Inspector to the various railway companies in British Columbia, Alberta, Saskatchewan and Manitoba, prescribing the measures to be taken by each for the prevention and control of fires during the balance of the fire season.

In order to ensure proper enforcement of the various requirements, arrangements were made whereby certain officials of the British Columbia Forest Branch and of the Dominion Forestry and Parks Branches were appointed fire inspectors by the Board of Railway Commissioners. These field inspectors were given authority to modify the requirements according to local needs, thus ensuring adequate protection at a minimum of cost to the railway companies. In some cases, these men devoted their whole time to the work, while, in others, the fire inspection was handled as a part of their regular duties.

Some delays were caused by difficulty on the part of the railway companies in securing extra equipment and men, while, in some cases, the patrols prescribed proved not to be needed on account of phenomenally wet weather. The plan worked out very satisfactorily. The last half of the fire season proved unusually wet, so that fire losses were exceedingly light, and the efficiency of the newly-formed organization was not unduly strained. With the better organization that will be available, the work should be handled in a very efficient way during the season of 1913.



THE RESULT OF A FIRE STARTING FROM A RAILWAY

Merchantable timber and young growth destroyed ; no reproduction. More timber has been uselessly destroyed each year by fire than has been used.



FOREST PLANTATION ON ABANDONED FARM-LAND IN SOUTHERN ONTARIO ; BLOW-SAND FORMATION

This land was once covered with splendid pine forest. It should never have been cleared for farming purposes. Non-agricultural lands should be withheld from settlement.

Fire-Guards The requirements as to the construction of fire-guards were practically the same as in previous years, with the exception that guards were required in Manitoba in addition to Alberta and Saskatchewan. The Chief Fire Guardian of the Department of Agriculture of Alberta was appointed Fire Guard Inspector for that Province and a similar plan is proposed for Saskatchewan. A study of the fire-guard situation is now being carried on, in the hope of making the requirements for next year correspond as closely as possible to local conditions, at a minimum of cost to the railway companies and of loss and inconvenience to land owners.

Clearing Rights-of-Way Much was also accomplished through close inspection in securing compliance with Section 297 of the Railway Act, which requires the destruction of inflammable material along rights-of-way.

Oil-Burning Locomotives The use of oil-burning locomotives on the main line of the Canadian Pacific Railway between Kamloops and Field, and on the main line of the Great Northern railway south and southeast from Vancouver, has enormously decreased the fire danger in those portions of British Columbia. The further extension of the use of fuel oil is greatly to be desired in this connection.

Organization in the East After the work was organized in the West, it was too late to organize in the east for the small remaining portion of the fire season of 1912. The matter of co-operation has however been taken up by the Board with the Governments of the provinces of Ontario, Quebec, New Brunswick and Nova Scotia. In some cases, the plan of co-operation has been confirmed promptly by the provincial government, while in others action has been more slow, especially with regard to the designation of the official to be appointed Provincial Fire Inspector. A number of subordinate inspectors will also be needed in Ontario, Quebec and New Brunswick, to assist the Provincial Fire Inspector in handling the details of the work in the field. However, it is believed that the organization will ultimately be completed and that the provisions of the Order regarding patrols will be extended to cover the entire Dominion during the fire season of 1913.

2. *Lines not subject to the Railway Commission.*

Government Railways In order properly to supplement the protection possible under Order 16,570 as to lines under the jurisdiction of the Board, it is recommended as to lines not so subject,

that the Intercolonial and National Transcontinental railways organize a fire-protective service along the lines of Order 16,570. While some fire-protection work has been done, it has not been enough, and the burden of responsibility as to patrol has been too much thrown upon the provincial authorities. Through the Railway Act and the issuance of Order 16,570, the Dominion Government is committed to the distinctly progressive policy of requiring railways to handle the fire situation along their own lines. It is only logical that the Government-owned railways should set a good example in this regard.

**Provincially
Chartered
Railways**

In the various provinces, the situation as to provincially chartered railways is as follows:

New Brunswick.—In New Brunswick, an amendment of 1911, provides that each railway company, upon being notified by the Surveyor General, shall, between May 1st and December 1st of each year, provide a motor speeder, to be manned by at least three men, to patrol fifteen minutes after each train running through forest country; the particular portion of the railway line to be so patrolled to be designated by the Surveyor General, and the cost of such patrol to be borne by the railway company. This requirement is somewhat more non-elastic than seems wholly desirable, and it is believed that its efficiency would be increased were the Surveyor General given full discretion as to the kind of patrol and the time when it should be required. In other words, pattern might well be taken from the general features of Order 16,570. However, the enforcement of the law as it stands should effectually prevent fires along provincially chartered lines. The essential, at the present time, is the formation of a special organization to handle all lines of forest fire work throughout the Province. It is understood that the Government now has this matter under consideration.

Nova Scotia.—In Nova Scotia, the Halifax and Southwestern railway is the only line along which there is any serious fire danger that is subject to the jurisdiction of the Province. The railway authorities have voluntarily co-operated to a considerable extent in preventing fire damage, but it is believed that this situation should be definitely taken in hand through legislation, as in the other provinces.

Quebec.—In Quebec, this matter has been handled through the issuance by the Provincial Public Utilities Commission of an Order almost identical with Order 16,570 of the Board of Railway Commissioners.

Ontario.—The situation in Ontario appears to be satisfactorily provided for through a provincial act authorizing the placing of fire rangers along the railway lines and charging the expense to the companies concerned.

Prairie Provinces.—In Manitoba, Saskatchewan and Alberta, very nearly all lines are subject to the jurisdiction of the Board.

British Columbia.—In British Columbia, the situation is covered by the Provincial Forest Act of 1912, which gives to the Minister of Lands ample discretionary authority as to railway fire protection.

The situation as to provincially chartered lines is really not so serious as might at first appear, since the mileage of such lines not subject to the Railway Commission comprises but a very small percentage of the total railway mileage of Canada. However, the matter deserves further attention in some of the provinces.

BRUSH DISPOSAL

There has been much discussion as to the disposal of brush from lumbering operations, but comparatively little definite action has yet been taken in Canada, except on paper. The slash menace is undoubtedly the most serious problem in connection with efficient fire protection.

In meeting this problem, the newly-established forest policy of British Columbia is the most progressive in Canada, since full discretionary authority is given the Minister of Lands in prescribing the measures to be taken, and efficient enforcement is provided through the organization of a fully-equipped Forest Branch.

In the issuance of all future licenses and in the renewal of the existing licenses, the Dominion and Provincial Governments should, in addition, to seeing that reproduction is assured, take more fully into consideration the prevention of fires through proper brush disposal. In many cases, the present difficulty is not so much a lack of legislation or of regulations as of suitable administrative machinery on the ground for the enforcement of existing provisions. More complete provision should therefore be made for the proper enforcement of such requirements through an increase in the forest staff and by raising the standard of personnel through the general adoption of the merit system of appointment and promotion.

In order to make properly effective the measures which the railways are required to take for the prevention of fire along their lines, provision is especially needed for the proper disposal of slash along all

railways through forest country. It is essential that existing inflammable material be removed along a wide strip outside the right-of-way, and that this action be made a fundamental requirement in connection with the issuance or renewal of timber licenses in the future. The same precautions should be observed wherever waggon roads run through forest sections.

CO-OPERATIVE FIRE PROTECTION

One of the most encouraging signs during the past year, in connection with better fire protection in the east, has been the organization of the St. Maurice Forest Protective Association. This Association is composed of limit-holders in the St. Maurice valley, Que. A manager, three inspectors and 50 rangers for patrol work were employed during the past season. As a result, while 97 fires were extinguished, only one attained proportions of any consequence, and this was in an old cutting. In addition to patrol, a start has been made in the construction of permanent improvements such as trails, telephone lines and look-out stations. The cost is met by an assessment upon limit-holders in proportion to acreage, aided by a contribution from the Quebec Government, in consideration of the protection of provincial property. It is to be hoped that the activity of this association will be extended, and that others will be formed. Most efficient results have been accomplished in a similar way through the formation of lumbermen's co-operative associations in the states of the Pacific Northwest.

FOREST SURVEYS AND FIRE STATISTICS

**Provincial
Forest
Surveys** It is essential to the preparation and adoption of any intelligent plan of forest management to know first, in a general way, what are the conditions to be met. In this connection, the great importance of a general stock-taking to determine the extent and location of the forest resources of Canada, should be emphasized. A false sense of security has prevailed in the past, due to the general belief in the existence of forest resources very much greater in extent than now appear to exist. A forest survey of the entire Dominion would be a tremendous task for the Commission of Conservation to undertake directly; it would require years of effort, the building up of a large organization and the appropriation of a very large sum of money. Nor should it be necessary to handle the situation in this way. The Province of Nova Scotia has completed such a sur-



GOOD FORESTRY PRACTICE

The forest as a resource perpetuated by wise use. Fire danger minimized by proper brush disposal. A future stand of merchantable timber assured by preservation of young growth. Non-agricultural lands should be made to produce successive timber crops.

vey, the work having been done during the summers of 1909 and 1910 under the direction of Dr. B. E. Fernow. The Forest Branch of the Department of Lands of British Columbia has already begun a forest survey of that Province. It is most logical that this class of work should be handled through action by the local organizations, and it is recommended that this Commission urge action along this line. In Alberta, Saskatchewan and Manitoba the work should be handled through the Forestry Branch, Department of the Interior. In Ontario and Quebec, the work of the existing forestry organizations might be extended, while in New Brunswick the work could be handled under the direction of the Surveyor General.

Fire-Loss Statistics It is recommended further that this Commission urge upon the various governments concerned the systematic collection of complete statistics of forest fire losses. In many cases the data collected in the past have been so incomplete as to be almost valueless. There is a very noticeable lack of information as to acreage covered by fires, and the amount and value of timber and other property destroyed. Such statistics are essential in order to determine the efficiency of fire-protective measures in effect, and to serve as a basis for improvement.

RESERVE EXTENSION IN NORTHERN ONTARIO

Non-Agricultural Lands A brief preliminary reconnaissance of a portion of Northern Ontario was made last summer for the Commission by Mr. J. H. White of the Faculty of Forestry of Toronto University. This examination shows that a large percentage of Ontario west of Sudbury and south of the height-of-land is non-agricultural and is valuable only for the production of timber. Fires have done enormous damage, especially during the period of railway construction. However, a great deal of valuable young growth has come in which requires protection that it may reach maturity. Some merchantable timber which has not yet been included in forest reserves or in timber limits, yet remains in regions back from the railways.

A Possible Reserve Ultimately, the whole territory south of the Clay Belt, and lying between the Timagami and Nipigon reserves should be included in permanent forest reserves and protected and administered under forestry principles. This section will unquestionably prove a source of large revenue to the Province in the future. However, the area is so large and the immediate possibilities

for revenue so limited that it seems doubtful whether reservation would be considered justified at the present time by the Provincial authorities, in view of the very large expense involved.

It is therefore recommended that, if possible, an arrangement with the Provincial Government be made for a co-operative examination next summer of a portion of this region, for the purpose of securing more detailed information as to just what action it is most important and most practicable to take in the matter.

DOMINION FOREST RESERVE EXTENSION

During 1911, the Commission of Conservation took an active interest in the establishment of the Rocky Mountains Forest Reserve, and assisted materially in securing the large addition which increased the area of Dominion forest reserves from less than 3,000 square miles, to about 25,000 square miles.

Throughout the past summer, the Forestry Branch of the Department of the Interior has continued the examination of forest lands in the West. As a result, reports have been prepared, indicating the desirability of further increasing the forest reserve area in Manitoba, Saskatchewan, Alberta and the Railway Belt of British Columbia, by some 10,708 square miles—an increase of 43 per cent.

Practically all of this land is reported as being non-agricultural and chiefly valuable for the production of timber. On much of it, fires have caused extensive damage, so that the amount of merchantable saw-timber over considerable areas is relatively small. However, in addition to the saw-timber, which in the aggregate amounts to a great deal, there is a large amount of pulpwood and a vast area of young growth which, if protected from fire, will become of merchantable size while other resources are becoming exhausted. The relative accessibility of a great deal of this timber land to the new settlements in the Prairie Provinces makes reservation and protection very important. For these reasons, the areas recommended should be included within permanent forest reserves.

Of the proposed additions, 72 per cent, or 7,698 square miles, is in Alberta. About two-thirds of this, or 5,023 square miles, comprises the proposed Lesser Slave forest reserve lying south and west of Lesser Slave lake, and east of the trail between Edson and the Peace River district, the south boundary being the Athabaska river. The balance is made up of several additions to the Rocky Mountains reserve, the

boundary examination of which had not been completed when the Forest Reserves Act was passed. The additions lie to the east of the present line, and consist largely of foothill country and muskeg.

Eight and four and a half per cent, respectively, of the total additions recommended are in Saskatchewan and Manitoba. These are spruce, jack-pine and poplar lands, partly muskeg and partly sandy, of no agricultural value, but of great importance as potential sources of timber supply for large prairie sections. The timber in certain portions of the proposed additions is already disposed of as licensed timber berths, and on some of these areas extensive lumbering operations are being carried on.

Proposed Reserves in British Columbia	The areas in British Columbia recommended for addition comprise approximately 15.5 per cent of the total. This is mountainous, timbered land in the Railway Belt, and is of great importance as a watershed, draining into irrigation districts where water is essential to the best use of large agricultural areas.
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GAME PRESERVE IN THE ROCKY MOUNTAINS

It is of interest to note that a recommendation is to be submitted by the Dominion Forestry Branch for the establishment of a game preserve in the southern portion of the Rocky Mountains Forest Reserve. The proposed game preserve lies due north of the Glacier National Park, which is situated in the northwestern portion of Montana, and which serves, also, as a game refuge. The establishment of a similar refuge in southwestern Alberta adjoining the Glacier National Park has for several years been advocated by the Camp Fire Club of America and by a considerable number of prominent men in Canada. The proposed action of the Forestry Branch would unquestionably assist materially in the conservation of wild animal life in the Rocky Mountain region.

It is also highly desirable that similar action be taken by the Government of British Columbia in the establishment of a game preserve in southeastern British Columbia, adjoining the area in Alberta to be covered by the game preserve recommended by the Dominion Forestry Branch and extending westward to the Flathead river, thus coinciding with the western boundary of the Glacier National Park.

FORESTRY IN NOVA SCOTIA

During the summers of 1909 and 1910, the Government of Nova Scotia caused an examination to be made of forest conditions in that

Province, under the direction of Dr. B. E. Fernow. A brief summary of the situation was presented at the annual meeting a year ago, and the complete report on the examination has recently been published by the Commission of Conservation.

It appears that not more than 20 per cent of the area of the Province can be classed as even potentially agricultural, that 10 per cent is hopelessly barren, and that 70 per cent is actual or potential forest land, very much of which is now in poor condition but is capable of restoration. At the present rate of cutting, the merchantable timber will be exhausted in from twenty to twenty-five years.

The importance to the Province of conserving its forest resources is clearly shown, and the recommendation is made that the Government appoint a technically educated Provincial Forester, to study the situation in the various localities and act as public adviser or instructor—a wandering teacher. It is recommended that the Commission endorse this recommendation and urge its adoption by the Government of Nova Scotia.

Similar action should undoubtedly be taken, also, with regard to New Brunswick.

SUMMARY OF CONCLUSIONS

It is recommended

1. That the Commission approve the principle of co-operation between the Board of Railway Commissioners and the fire protective organizations of the Dominion and Provincial Governments in the administration and enforcement of the fire regulations of the Railway Commission, along the lines now in effect in the West and as proposed in the East.

2. That representations be made to the Dominion Government looking toward the establishment of a fire-protective service along the Intercolonial and National Transcontinental railways similar to that provided for in Order 16,570 of the Board of Railway Commissioners.

3. That the governments of New Brunswick and Nova Scotia be urged to organize separate branches devoted especially to forest fire work, including all lines of railway fire inspection, as well as the handling of fire-ranging throughout the provinces at large. Also that control be definitely taken over with regard to fire-protection along provincially chartered railways, through the enforcement of existing legislation or the enactment of new legislation where necessary.

4. That the Commission urge the Dominion and all provincial governments not now doing so, to consider carefully the question of



A FIRE-SWEPT VALLEY IN BRITISH COLUMBIA

Better methods of organization are decreasing the danger of such losses occurring in the future.

brush disposal in connection with all new licenses and renewals of old licenses issued in the future. Especial care in this connection is needed to safeguard the country along railways and waggon roads. Especially in Ontario, New Brunswick and Nova Scotia and in the Timber Branch of the Department of the Interior is the further development of a forestry organization essential in order properly to study and administer this feature of the work.

5. That the Commission approve the organization of co-operative fire-protective associations of limit-holders, and the principle of contribution by the Dominion Government and provincial governments, in proportion to the benefits received.

6. That the Dominion Government be urged to begin a systematic study of the extent and character of forest resources in the forest reserves, and other forest lands under its direct jurisdiction; and that a similar course be urged upon the provincial governments of Ontario, Quebec and New Brunswick as to forest lands within their boundaries.

7. That the systematic collection of complete statistics of forest fire losses be urged upon the Dominion Government and the provincial governments wherever this action is not now being taken.

8. That the Commission approve of co-operation with the Government of Ontario in an examination of forest conditions outside the forest reserves in the northern portion of that Province, south of the Clay Belt; and that favourable reciprocal action by the Ontario Government be invited along this line, as well as in developing a plan of recuperative measures in the Trent River watershed.

9. That representations be made to the Dominion Government, urging that favourable action be taken with regard to the proposed additions to the forest reserves recommended by the Forestry Branch.

10. That the proposed establishment of a game preserve in the southern portion of the Rocky Mountains Forest Reserve, and in southeastern British Columbia adjoining the Glacier National Park, be endorsed; and that favourable action be urged upon the Dominion Government and upon the Government of British Columbia.

11. That, whereas, the provinces of British Columbia, Ontario and Quebec have recognized the value of organizing a provincial forest service, representations be made to the governments of Nova Scotia and New Brunswick, looking toward the appointment of technically educated provincial foresters; this action to be taken not only for the purpose of securing a conservative use of the remaining forest resources, but also for the purpose of stimulating and educating forest owners and woodlot owners in the work of reforestation.

12. That the Commission place on record its opinion that it is important that all appointments in the forest services of the Dominion Government and the provincial governments should be based on capability and experience, such as may be secured through civil service examination.

DISCUSSION

DR. ROBERTSON: It seems to me that in the recommendations of the Committee on Forests, some mention should be made of a matter that is omitted from the report. The report records excellent work done in many important fields, especially in protecting the forests in large areas against the devastation of fires, but forestry, after all, means two things. There are very large areas in the provinces of Ontario and Quebec in both the older and the newer settled portions where farmers should grow trees for various uses; and unless the Commission expresses itself on this subject, it is apt to be considered delinquent in one respect at least. The matter is an important one. The Province of Ontario depends on the United States for coal. That is a dangerous situation. Manitoba is still worse off. It seems to me the Commission should begin to urge upon the people the growing of trees even on agricultural lands for the two purposes of providing fuel and for the amelioration of not only the wind influences, but also the climatic conditions of the locality. I would like to see the Commission recognize these two matters as being of not, perhaps, equal urgency in point of time, but of equal importance in the long-distance view.

REV. DR. BRYCE: I quite agree with Dr. Robertson in this particular. I think it is most important that we should have some information about the amount of forestation on the prairies. A good deal has been done by the Dominion Government, I do not know how much. Perhaps the Committee on Forests could get the information from the Department of the Interior, and place it before us.

MR. LEAVITT: I quite agree with the view advanced on this matter and the subject should have been brought out in the report I have read. As a matter of fact, a considerable amount of data has been gathered with regard to the amount of tree planting in the Dominion. We have collected material from the Forestry Branch and from the provincial governments, and it is now being put in shape for publication. For this reason, and also as the report as it stands is pretty long, it was not mentioned here.

Reforestation in New Brunswick MR. SNOWBALL: As far as reforestation is concerned, probably Mr. Leavitt does not know that some reforestation has been done in New Brunswick. A company formerly known as the Bay Shore Reforestation Company imported a large quantity of trees from Germany and the United States and have commenced to reforest a section of their holdings, part of which are freehold, and part Crown lands. On the shore of the bay of Fundy in New Brunswick growth is more rapid than in the northern portion of the Province and the company hopes, within the lifetime of some of the present generation, to reap some reward from its efforts.

Responsibility of the Intercolonial In reference to Order No. 16,570 of the Railway Commission, and the Intercolonial, I have always thought that the Government that felt it wise to put responsibilities upon the railways that were private corporations, should also feel that a like responsibility rested on its own lines of railways. If the Grand Trunk or the Grand Trunk Pacific or the International Railway of New Brunswick, should be subjected to the orders of the Railway Commission or to the orders of the provincial governments, I could never see why the Intercolonial railway should not be subject to the same jurisdiction. Surely the same laws should be made applicable to the Intercolonial railway as to other railways. Only a couple of years ago the Intercolonial railway was not liable even for the animals it killed, no matter how they got on the railway, but it assumed that responsibility a few years ago. Why not extend that principle and make it responsible for the damage through the fires it sets, as well? In New Brunswick, the Intercolonial passes almost entirely through the Crown lands of the Province, and it is, to a certain extent, endangering them. Yet it does not hold itself liable for the damage it does, as is the case with the Canadian Pacific railway or the International railway. A government that recognizes the necessity of controlling other railway corporations, should also make railway legislation operative in so far as its own line is concerned.

Brush Disposal As the trees grow much closer together in New Brunswick than in British Columbia and some other provinces, the growth is smaller and closer, and brush disposal is very difficult. The Province now requires that all tops down to five inches in diameter must be taken out, and on the smaller tops, the branches must be lopped off. I would ask the Forester if there are not some advantages, as well as disadvantages to be derived from leaving a certain amount of brush on the ground. Personally, I consider there

are advantages, but I am not a forester, but a practical lumberman. I would like to know just what foresters think on this subject. I am satisfied there are advantages to be derived from it, although it may be dangerous too. In the old days, tops less than eight inches in diameter were not taken out. Consequently, it was difficult to get through the woods and the tops no doubt, were somewhat of a menace. The present method, however, I do not consider to be dangerous.

**Co-operative
Fire
Protection** Then it is important that there should be co-operation in fire protection between companies, and, also between the companies and the Province. We have no real co-operation between the Province and the limit holders in the Province of New Brunswick. Some of the companies which co-operate among themselves, have put in telephone lines covering their whole territory. They have rangers going through the forests, who can communicate with their head offices. They have to pay the expenses themselves and also have to look after outbreaks of fire on the lands of their neighbours. I am sorry the Premier of our Province and also the Commissioner of Crown Lands, is not here, because I think it is a matter of vital importance in New Brunswick. The company with which I am connected, has telephone lines going through its limits, so that its men can communicate promptly at all times from the woods to the head-office. It has connections with the New Brunswick Telephone company's lines, which makes it possible to do this.

**Forest
Surveys** With reference to the question of taking stock of forest resources, there is an act in New Brunswick providing for that, but it has never been acted upon. I do not know why the Government has not taken some action to arrive at some idea of just what the actual quantity of timber we have in the forest is, and just what the growth is. They may be expecting, as they sometimes do in our Province, that the poor unfortunate limit-holders will do the whole thing for them.

DR. C. G. HEWITT: I may be regarded as a peculiar person to venture to offer statistics with regard to the number of trees planted in the West, and the rate at which planting is going on, but, as you may know, all trees imported into the Western provinces from the United States, have to pass through our inspection and fumigation station at Winnipeg. This enables us to obtain statistics of the number imported. During the season of 1911-12, there passed through that station for the three Western provinces, over a million and a quarter trees, most of which were ornamental and shade trees. The importa-

tions are increasing every year and to such an extent that the Minister has now decided to establish an additional station in Saskatchewan. At present, the trees can enter only at Winnipeg. The additional station, which is to be established this year, will thus increase the facilities the farmers now have to import trees.

MR. SNOWBALL: What kind of trees are imported? Are they largely ornamental and shade trees, or trees that have a commercial value as well?

DR. HEWITT: I am referring to ornamental and shade trees, rather than commercial trees—various kinds of poplars and maples, and a few conifers.

DR. GEORGE BRYCE: How many are grown by the Government and how many are put out by the Government through the country? The Dominion Government is carrying on a considerable amount of afforestation, and, I think, has a reserve where trees are grown and planted.

DR. HEWITT: That is a question for Mr. Campbell to answer.

HON. O. T. DANIELS: It is interesting to note that in Nova Scotia we have largely taken the initiative throughout Canada, in the matter of laws dealing with this subject. I may say, for the information of the Commission, that we have found that the law introduced into the Province of Nova Scotia and enforced somewhat inefficiently as it may have been, has been of the greatest possible benefit in the saving of our forests.

MR. CHAIRMAN: When did you introduce it?

HON. MR. DANIELS: In 1904. With respect to fire protection along railways, it is true that we have not, as yet, formally determined to co-operate with the Railway Commission, but I take it for granted that it will be only a very short time until we must come to the same conclusions as have already been reached in other provinces, viz., that we must do something with respect to railways under the control of the Provincial Government in Nova Scotia. It is true that we have only one such railway, but I am afraid that when we investigate the woods along this railway, conditions similar to those which now exist along the Inter-colonial railway will be disclosed. That railway, as I understand it, has been causing fires along its line in Nova Scotia and New Brunswick, until all the woods near it that can be burned have been destroyed. I am afraid the same conditions will be found in Nova Scotia.

THE CHAIRMAN: With regard to the matter of tree-planting to which you have just referred, we shall hear from Mr. R. H. Campbell who has consented to address us on the work of his branch. I have much pleasure in calling upon Mr. Campbell.

WORK OF THE DOMINION FORESTRY BRANCH

MR. CAMPBELL said:

Mr. Chairman, I have not prepared a formal paper. I was asked merely to state or to enlarge a little on, the question of the Rocky Mountains Forest Reserve in the Province of Alberta, the extension of that reserve and the related question of game preservation in it. But, as some other matters have been brought up in the discussion, perhaps I might refer to them first.

Tree-
Planting

Reference has been made to the question of tree-planting on the farms in the Prairie Provinces. Dr. Hewitt gave some statistics as to the importation of trees for ornamental purposes. The planting done by the Dominion Government is not for ornamental purposes, but only for shelter belts and wood lots. The reason for that is, that, where commercial nurseries can supply the demand, we do not feel that the Dominion Government should step in and take the business; but, where commercial nurseries can not supply the demand, and the need exists, we consider the Government has a perfect right to step in and meet the need. It is on that basis that we undertake to supply trees to farmers in the West; none of the nurseries established in the West are able to supply trees in large quantities or at reasonable prices. There are several commercial nurseries in the West, and they are, I think, sufficient to supply the farmers with such ornamental trees as are not imported. At any rate, it is not felt that the Department should do more than provide trees for shelter-belt and wood-lot purposes.

Saskatoon
Nursery

We have distributed so far, over twenty-one million trees, and at the nursery at Indian Head, we now have about four million for distribution this spring, to farmers in Saskatchewan, Manitoba and Alberta. We found that the nursery at Indian Head was unable to produce sufficient stock annually to supply the increasing demand as settlement proceeded, and we have now secured a half-section near Saskatoon, which we consider one of the best distributing points. As all the Saskatoon property can be used for nursery purposes, we expect to raise as many trees as on the three-quarters of a section at Indian Head. This is not the case at Indian Head, where some of the land is somewhat broken. In a year or two, when we expect to have the nursery at Saskatoon working, we will produce a million trees a year.

DR. BRYCE: What kind of trees?

MR. CAMPBELL: A few hardy species mostly. We thought it advisable to send out trees sure to be a success, and the first trees sent out were ones that would grow fairly rapidly. In this way, the farmer can have something to show for his efforts in a short time and will be encouraged to go on. We have been using the Manitoba maple perhaps the most freely. It is hardy and grows quickly. We have used cottonwood to some extent. It grows quickly, but the stock is not as easy to get as it was, and, in some cases we find it kills back during the winter. I think we shall not distribute it as largely in the future. Elm does very well. We distributed a considerable number of ash, and it is one of the most satisfactory trees we have. It takes longer to start to grow than maple, but, when it gets well established, it grows well and is a much more lasting and useful tree than the other. We distribute willows to a considerable extent, and we are now making a distribution of coniferous trees: white spruce, Scotch pine and tamarac; but it takes considerable area and time to work up a stock of coniferous trees and we are, therefore, not undertaking that to any large extent. Generally speaking, it will be deciduous trees that will be distributed, and some conifers. When a farmer has a belt of deciduous trees for shelter, the conifers will have a better chance to grow.

Patrolling
Railways Mr. Leavitt emphasizes the importance of a fire-patrol along railways. During the past year we have found this patrol to be of considerable advantage. We arranged with Mr. Leavitt for the appointment of some of our men as assistants to him and as officers of the Railway Commission, and, through his efforts and those of our men, all of whom have handled their work very well, the patrol has been organized and the rights-of-way are being put into better shape. As it was a wet year, we can not claim that the immunity from fire was altogether due to improved administration. I think it is considerably due to that, and as the organization is perfected, am sure the railway fires can be very largely eliminated.

Brush
Disposal I might refer to the question of brush disposal since it has been mentioned, although I had not intended to speak about it. We have not done very much in this line of work as yet, but we have made a start in one or two places, and we are making some experiments in burning to see what the cost and effect will be. Unfortunately the experiments, so far, have been inconclusive and we have not secured any results that I would care to present to the Commission. The question is being considered, and, as Mr. Leavitt

has pointed out, the matter of dealing with it is not so much a matter of legislation, because we have sufficient legislation, but a question of having an efficient staff and one that is large enough. The question of an efficient staff is, perhaps, the most vital problem that has to be faced at the present time; a staff that understands its business and is prepared to do it.

With regard to the question of forest reserves, we have
**Classifica-
tion of Lands** felt that one of the most important things that we have to do at the present time is to expedite the inclusion in forest reserves of all lands that are non-agricultural. As you know, the West is being rapidly populated and settlement is spreading out in all directions from the open prairie country into what is more or less 'bush' country. In many cases settlers are taking up lands that are not suitable for agricultural purposes. We are, therefore, making an effort to catch up with, and get ahead of, that movement of settlement, so that, before the settler takes possession, we will have the land classified into agricultural and non-agricultural. The non-agricultural lands, of course, should be administered on a permanent basis and the point cannot be emphasized too strongly that, if we are to have a forest administration of the proper character, we shall have to get a permanent place in which to carry it on. Non-agricultural lands ought to be separated from the agricultural lands as soon as possible; it is only then that we can proceed with a proper administration, an independent and a special administration for timber purposes. Until that is done, we shall be working very largely at haphazard and shall find our work nullified in many cases by settlers coming in and allowing fires to spread from their clearings. We are trying to push that work forward and within a year, if our recommendations in regard to reserves are approved, we will get to a point where we are fully abreast of, and a little ahead of, settlement, and can, from that time, keep ahead in delimiting the non-agricultural lands.

I wish to speak now of the forest reserve in Alberta. The reserves in that Province are especially important on account of the extensive reserve on the eastern slope of the Rocky mountains which was set apart largely on the recommendation of this Commission. That is a very large and a very important reserve. It presents, perhaps, the most important forest problem that has to be handled in Canada at the present time. Before it was set apart by Act of Parliament, we had made an examination to determine what was to be its eastern boundary. The western boundary is the summit of the mountains and there was no difficulty in determining that. The question was, where to draw

the line between prairie and timber, and we made an examination to determine this line before this territory was added to our reserves. We have continued that examination in the southern portion of the reservation near the Crowsnest Pass railway.

A similar problem is presented by an outlying range of the Porcupine hills. These hills are 5,000 feet high, and are situated in the centre of a ranching district. They are covered with a forest of Engelmann spruce, lodgepole pine and Douglas fir. It is a very important area of forest in the middle of a ranching and irrigated district. It has now been included in a temporary reservation and a recommendation has been made with the object of putting it into a permanent reserve.

**Extending
the Reserves** Before the Act was passed, we had completed our examination from the international boundary to the North Saskatchewan river, except that we had not covered the Porcupine hills I have mentioned. The season before last we continued the examination of the eastern boundary of the reserve from the North Saskatchewan river as far as, and a little beyond, the Athabaska river, and we now propose extending the eastern boundary of the reservation between the North Saskatchewan and Athabaska rivers to a considerable distance towards the East. We found that, towards the north, the mountain belt is wider and the foot hills extend out farther. Thus, because the mountains do not break abruptly into plains as they do farther south, it was somewhat difficult to draw the line between the agricultural and non-agricultural lands at the right place. We have, however, come to the conclusion to recommend a considerable addition, composed of the territory between the two rivers and to the east of the present reserve. The whole addition would probably comprise an area of two thousand six hundred square miles. There is still an area to be examined north of the Athabaska river and extending into the Peace River country, and I hope we will get that done this year.

**Proposed
Lesser Slave
Reserve** It has been proposed to set aside a large reserve south of Lesser Slave lake. This area was examined the season before last, the party going in on the east and north sides, and making the examination from the Lesser Slave. It has an elevation of from 3,000 to 4,000 feet and, generally speaking, is of a rather broken character. There is considerable muskeg in it, which is covered with a spruce and pine forest. Some of this forest has suffered considerably from fire, but, on the whole, there is a very good stand. It is an interesting place for the forester, because the jack pine (*Pinus*

Banksiana) of the East and the lodgepole pine (*Pinus Murrayana*) of the West come together at that point; westward from there, you find the lodgepole pine instead of the eastern jack pine. That is a tract which I am satisfied will become a very valuable forest area if it can only be protected. As yet settlement has hardly reached it, and there are no railways through it.

Last autumn the Canadian Northern railway crossed the Athabaska river on its way through the Peace River country paralleling the old Edmonton trail. We have a man there to see that the right-of-way is cleaned up properly.

**Northern
Alberta
Wooded**

The area of the Rocky Mountains Forest Reserve is eighteen thousand square miles and the proposed addition is about two thousand six hundred square miles in area. The Lesser Slave Lake district, which it is proposed to form into a reserve, is about five thousand square miles in area. There will thus be quite a large area of forest reserves in Alberta if these projects are carried through. There will also be a considerable area of lands farther north in Alberta that will have to be made into forest reserves. The provinces we have heretofore considered as the Prairie Provinces are very largely timber provinces and have large areas of forest that will have to be administered for their own good and for the good of the Dominion generally.

**Administra-
tion of
Reserves**

There are a few questions to be noted in regard to the administration of the Rocky Mountains Forest Reserve. For administrative purposes it has been divided into several divisions, one man with a number of rangers under him being in charge of each. Farther north, where there are not so many people, fewer men are needed, but, in the southern portion, there are ten or twelve men in each division. We have started to make trails and roads to make the different parts accessible, and telephone lines have been constructed. However, we did not accomplish all we expected in that respect, owing to some changes in the staff, and other hindrances.

**Game
Preserves**

There is also the question of the administration of game in that territory. The Rocky Mountains Forest Reserve is a large area to consider as a game preserve of any kind. It is six hundred miles long, and its width varies greatly, being quite narrow at the international boundary, and widening out toward the north until it is sixty miles in width. We have consulted the provincial authorities as to the best way to handle that reservation in the interests of game preservation. Their suggestion was, that, in

addition to the game preserves already established, there should be a preserve at the south end, adjoining the international boundary, in which the shooting of game, except bighorn, mountain goat, panther and bear, should be prohibited. That would mean that all other big game would have to be shot outside the reservation. The reason advanced for allowing sheep and goats to be shot within the preserve was that as they are only found at high altitudes, that was the only place where they could be killed. It is problematical whether it is advisable to so completely shut out the sportsmen from that whole territory, but there can be no question that certain portions of the reservation should be set apart as game preserves.

A Needed Game Preserve Of course, there are already the game preserves at Banff on the Bow river and in the vicinity of the Grand Trunk Pacific railway in Jasper park. The proposal now is—and it has been brought to the attention of the Government on several occasions—to establish a game preserve immediately north of the international boundary. The Camp Fire Club of New York has urged the matter, and the Government of the United States has brought it to the attention of this Government, since the United States has established a large preserve for game immediately to the south of the international boundary, and including both the Atlantic and Pacific slopes of the Rocky mountains. The western slope of the Rocky mountains in Canada, is, of course, under the jurisdiction of the Government of British Columbia, but the Dominion Government has jurisdiction over the eastern slope, and, therefore, the establishment of a game preserve there, would come under the Dominion. The territory there would be particularly valuable as a preserve for Rocky Mountain sheep and goats. These animals are found there now in considerable numbers, and, if they are properly protected, they would probably thrive well. Unless some protection is given in the near future, I am afraid that their number will be considerably depleted, if indeed, they are not exterminated. It is important that a preserve should be established, and it is our immediate intention, under the authority that is vested in the Governor in Council by the Forest Reserve Act, to ask the Government to establish a game preserve there. As yet, the exact limits have not been determined, but we have the information to enable us to do so. With a game preserve at the international boundary, one on the Bow river and one on the Athabaska river, the present necessities of the case will probably be met. Any further game preservation, beyond a strict enforcement of provincial regulations, may be left for future consideration.

**Indians and
Game**

This brings me to a consideration of the relation of Indians to game preservation. At Morley on the line of the Canadian Pacific railway, there is an Indian reserve for the Stoney Indians, a mountain tribe whose members are great hunters. A number of them have migrated to the 'Kootenay plain' on the upper waters of the North Saskatchewan river, well up into the mountains and considerably north of their reserve. The question has arisen as to the best action to take in regard to these Indians, and I would like the Commission to be informed respecting the actual situation. The policy of Canada towards the Indian has been to civilize him and induce him to settle on the land. In the Morley district, there is an opportunity to do this; the land is good for grazing, and, if properly handled, could support a number of people. The Kootenay plain contains considerable grazing land too, but I do not think it is equal to the grazing land at Morley and it is not of such great extent. If these Indians go to the Kootenay plain, they will remain hunting Indians exclusively and will not advance economically as they should. That would mean that in the vicinity of the Kootenay plain the game would be practically exterminated. The question is, what is the best thing to do, and it is no easy problem to handle a band of Indians. It is a question whether they should be required to go back on the reserve at Morley and stay there, or be provided for somewhere else. If there were no room at Morley and it became necessary to provide for them elsewhere, it seems to me that, in the interests of the preservation of the game, and, in the permanent interests of the Indian himself, it would be better if they were not permitted to settle at Kootenay plain, because they will remain hunting Indians and take every opportunity to destroy the game of that district. It is a rather important question in connection with game preservation in the Rocky mountains.

DISCUSSION

**Care of
Wood Lots**

DR. JONES: I understand that Dr. Robertson, in referring to tree-planting, is not so much concerned in tree-planting in the West as in the care and preservation of the farm wood lot. Perhaps seventy-five per cent of the farmers in New Brunswick have wood lots on their farms. In a great many instances, those lots are not taken care of, and the farmer himself is not receiving the permanent good he might have received from his lot if it were given proper care.

It seems to me the Commission might get in touch with a large number of people in a helpful way, if they could devise some means of

assisting the farmer by giving him proper instruction in the care of wood lots, especially in the matter of cutting systematically, so as to secure a permanent supply of wood and fuel from the wood lots under his control. In New Brunswick, a large proportion of the farmers have wood lots of their own and, in a great many cases, they have not been properly cared for. There is a permanent supply of fuel available from this source and it seems to me that the Committee on Forests might in some way instruct these farmers in the proper care of their lots and so secure a permanent supply of fuel in connection with farming operations. I mention this merely because I was afraid the Committee might miss the point of Dr. Robertson's remarks in this connection.

**Danger from
Government
Railways**

I also wish to urge the Committee to take action in regard to the protection of the forest from the Government-owned railways in New Brunswick. The National Transcontinental railway is now in operation through the forested section of the Province, and we know from our experience when that railway was being constructed that the Commissioners are not alive to the necessity of protecting the forest from fire. It seems to me that the Government should be urged to provide adequate protection for the forests from railways owned and operated by it. It should set an example to privately-owned railways in the proper protection from fire of forest lands adjoining the right-of-way. There is no doubt that, unless proper care is taken in connection with the National Transcontinental railway, a great deal of destruction will be wrought. This point should be urged very emphatically upon the Government.

THE CHAIRMAN: The Commission has not lost sight of that matter, and I am quite sure it will be dealt with as efficiently as it can be done.

DR. FERNOW: I have considered the question of wood lots in connection with my inspection of the Clay Belt in Ontario. It is really a provincial matter. The Commission of Conservation has done very well to bring together information that may stimulate the provincial authorities or set them at work on these matters. It is a matter that is close at home and while the Commission of Conservation might secure information and devise a plan, it seems to me that the provinces should also be allowed to do something. In Nova Scotia too, as well as in New Brunswick, there are large quantities of timber owned by small owners, but the conservation of it should be a matter of provincial concern.

THE CHAIRMAN: We fully recognize that it is a provincial matter. The object of Dr. Robertson, I think, is that when the Committee meets

and makes out its report it should, however, give some attention to this subject.

MR. SNOWBALL: There is a provision in land grants in New Brunswick that twenty-five acres is to remain as a wood lot which is supposed to come under the supervision of the provincial department administering that work.

THE CHAIRMAN: The control of these lots is vested in the provinces, and all we can do is to educate the provinces and the people on the matter as thoroughly as we can. This subject will be thoroughly dealt with when the Committee sits.

I shall now call on Mr. M. J. Patton for his report on the work done during the past year under the direction of the Committee on Fisheries, Game and Fur-bearing Animals.

FISHERIES, GAME AND FUR-BEARING ANIMALS

MR. PATTON said:

Considerable progress has been made by this Committee during the past year. At the instance of Dr. C. C. Jones, the chairman, a meeting for organization purposes was held in Ottawa on June 4 and 5, 1912, at which papers on various subjects connected with the work of the Committee were read and discussed. The report of the proceedings at this meeting has already been placed in your hands in book form.*

Resolutions at June Meeting	Resolutions were passed and forwarded to the Minister of Marine and Fisheries regarding (a) Research and demonstration work in oyster culture;
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(b) The planting of whitefish fry in the Great lakes where the production of that fish is decreasing;

(c) Action by the Department of Marine and Fisheries to secure more accurate and complete fisheries statistics; and

(d) The advisability of that Department publishing in its annual report a statement of the number of fry planted in each body or stream of water where such are planted in Canada. This last suggestion was acted upon by the Department and the Fisheries Report for 1911-12 contains, for the first time, a complete statement of the number of fry planted during the year in the various streams and bodies of water stocked by the Fish-breeding Branch.

* Published under the title, *Sea-Fisheries of Eastern Canada*.

**Curing and
Marketing
of Fish**

The necessity for instructing fishermen in curing and putting up fish for market, as well as for a standard-sized fish barrel and a system of government inspection and branding, was also discussed but, on assurance being given that these matters were then being dealt with by the Department of Marine and Fisheries, no representations were made. As yet, it may be stated, the Department has made no announcement of the putting in force of the contemplated measures to meet the existing situation.

**Oyster
Fishery**

During the past year the Dominion Government relinquished to the provinces of Prince Edward Island, New Brunswick, Nova Scotia and British Columbia the right to issue leases to actual and potential oyster-producing areas, although it still retains the legislative jurisdiction over that fishery. Last autumn the Assistant Secretary of the Commission visited Prince Edward Island and made a thorough investigation of the conditions prevailing in the oyster fishery there. The detailed report of this investigation will be presented to the Committee at this meeting. The principal features brought out in it are the inefficient condition of the fisheries protective service, the possibility of building up a very valuable oyster-farming industry, the need for revision of the present Federal oyster laws and regulations, which are not intended to apply to oyster-farming conditions, and the necessity for extended scientific investigation by a qualified biologist, of problems in the breeding of oysters upon the solution of which the future of the oyster-breeding industry depends.

**British
Columbia
Fisheries**

I desire to call your attention to the marked increase in the yield of the fisheries of British Columbia. In the last fiscal year, which ended March 31, 1912, this province produced over four and a half million dollars worth of fish more than it did in the previous year. The total value of the fish caught was \$13,677,125. This is \$4,309,575 more than Nova Scotia produced and nearly three times the value of those caught in New Brunswick. Up to the present time, the attention of the Committee has been directed mostly to the sea-fisheries of eastern Canada, and it would probably be wise now to enquire more thoroughly into the valuable fisheries of the Pacific. British Columbia, although a younger province than those on the Atlantic, nevertheless has its fisheries problems, and if the light of publicity is thrown upon conditions there now, these problems will admit of a more speedy solution than would otherwise be the case.

Fox-Farming In view of the activity in the demonstration of fur-bearing animals, notably in connection with the black-fox industry in the Maritime Provinces, the Committee authorized the preparation and publication of a bulletin on the subject. The report has been written and is now in process of publication.

Fisheries Expert The appointment of an expert on fisheries, game and fur-bearing animals was decided on at the meeting in June, and this matter will come up before the present meeting of the Commission for ratification. It is exceedingly difficult to find a man for this position, who possesses the combined scientific training and practical experience which the work demands. Until the appointment is made, however, the Committee cannot hope to accomplish as much as might be desired in the investigation of the various subjects with which it has to deal.

MR. SNOWBALL: At a meeting of our local Natural History Society, the matter of fish fry was discussed and the question was raised that the fall salmon from which the fry are taken is the wrong species of fish from which to propagate, and, as the hatcheries are on the Miramichi, and as the salmon is the most valuable fish in that section, it is important to that portion of New Brunswick. It is said that the eggs from the white salmon are taken, and the fish are in very poor condition. That would be a matter which this Committee might look into and see if any improvement could be made.

At the same time I might mention that our Natural History Society has lectures every week and it is anxious to hear lecturers from the Commission of Conservation on this subject.

THE CHAIRMAN: Mr. J. Walter Jones will now give us a paper on fur-farming in Canada.

FUR-FARMING IN CANADA

MR. JONES said:

When your committee on Fisheries, Game and Fur-bearing Animals decided to publish a bulletin on fur-farming in Canada, the extent and value of the industry was not fully appreciated. It was thought that there were a half dozen or more fur farms at scattered points and a group of a dozen or more successful fox farms in Prince Edward Island; that these farms could be examined in a few weeks and a report issued within three months.

Difficulties Encountered Work was begun on June 15 in Ontario. Eleven establishments engaged in the production of fur-bearing animals were visited and the existence of several others

was reported. In Quebec, by visits to furriers in Montreal and Quebec city, information was obtained respecting six more; and personal examinations of the mink ranch at Lac Chaud, near Macaza, Que., and the fox ranch of Holt, Renfrew & Co. near Quebec city were made. In Nova Scotia and New Brunswick, fifteen or sixteen fur farms were in operation in August last, but this number has since increased to thirty or forty. These farms were hard to locate and it was only by conversations with fellow passengers on the trains and the fur farmers that the information of their whereabouts could be obtained, the provincial authorities, in most cases, not knowing of their existence. Several times trips were made to see farms that existed only in the imagination of the informants, and, on one or two occasions, localities were found where it is almost certain that successful fur-farming was being done, but the methods followed and the exact situation of the ranches were not discoverable. The report was completed late in December, nearly five months having been spent on it.

Nearly all trading in foxes and fur-bearers takes place in the months of September, October and November and no foxes are moved from one ranch to another except during these months. The developments in the industry during the fall of 1912 were so rapid and unexpected that one could not be sure what to report until the business had settled down for another year—and, even now, it is difficult to predict its future because of the speculative trading indulged in. Short selling is usual at the present time and the majority of the expected offspring for 1913 is already disposed of.

Russia
Interested Before receiving my present assignment from the Commission, I had been in correspondence with Mr. Vladimir Generosoff, an agent in the United States of the Russian Department of Agriculture, whose government was interested in fur-farming. Later, after receiving this appointment, permission was obtained from the Secretary to assist Mr. Generosoff with all possible information of our work in this line. Mr. Generosoff arrived in September and was greatly impressed. His full report has not yet been presented to his government, but his preliminary report, sent in at once, is believed to have resulted in the sale of six pairs of Prince Edward Island silver foxes of the 1913 litters. The extension of the market for breeding foxes into Russia will probably result in more sales of breeding stock at satisfactory prices, and bring considerable wealth to Canadian producers.

The Commission is indebted to Mr. Generosoff for valuable information regarding game farms where animals such as deer, elk and

ducks are reared for the use of sporting clubs or for the purpose of re-stocking depleted territories. It is interesting to note that one game club on Long Island, N.Y., at a slight expense, reared 3,500 mallard ducks from about 200 breeders.

Production of Furs There is a lamentable lack of data in Canada on fur-farming and the fur trade. Neither the provincial nor the Federal authorities possess any data as to the importation or exportation of raw fur pelts. It was necessary to consult a German book, recently published, for estimated figures of raw fur pelt production of the various countries and continents. The author of this book, who has made this study his life work, spending thirty-five years on it and having rare equipment for the investigation, places the world's production of fur pelts, exclusive of goat, at about \$90,000,000 and America's annual production at \$24,000,000. Canada's production must be at least \$10,000,000. Other estimates by American authorities place the annual production of American fur pelts higher, at about \$40,000,000. At any rate, the total value of fur of wild animals in Canada is from three to five times the annual value of the wool and hides from Canadian sheep.

Problems of Jurisdiction While the wild animals of Canada are under the jurisdiction of the various provinces, the changed influences of modern life and the newer methods of hunting, as well as a rise in the economic value of wild animal life, present some difficult problems. For example, what legislative body should have charge of migratory birds? Who is responsible for the game and fur-bearers in the unorganized territory of Canada, in the Mackenzie basin and in the islands of the Arctic?

The migratory birds must eventually come under the charge of the Federal Government.* Of what use would provincial authority be when one hundred and fifty-four species of insect-eating game birds are being legally slaughtered, and when most of these nest in Canadian territory and winter in the United States, Mexico and other parts of America? The robin, one of the best of the pest-eating birds, and a beautiful songster, is legally killed as game in Louisiana, Mississippi, Maryland, North Carolina, Tennessee, Virginia and Florida. The bobolink, a protected bird in the provinces of Canada, is slaughtered all through the southern portion of this continent. On the day the season opened, thousands were shot in the marshes of the Potomac

* See Appendix II for text of the McLean Act, enacted into law by the United States to protect migratory game and insectivorous birds.

within sight and sound of the United States capital. Truly, Federal jurisdiction only will serve to secure uniform game laws and intelligent and scientific protection on this continent. The whole subject requires extensive study and only Federal bodies can properly undertake the securing and collaboration of data which would insure the making of intelligent treaties between the nations concerned. Migratory birds should come under the jurisdiction of a Federal authority for the same reason as foreign commerce is administered by the Federal Government.

**Losses
Incurred** The annual loss in the United States through insect depredations owing to interference with the balance of nature by the destruction of forests and birds is estimated by Professor Forbush, State Ornithologist of Massachusetts, at \$800,000,000. Destruction in Canada may be roughly placed at about one-tenth as great, or \$80,000,000. Of this loss the agricultural industry suffers the greater portion.

The losses occasioned by the depredations of carnivorous and rodent mammals are also enormous. The wolves and coyotes of Canada are a veritable plague for the destruction of wild, as well as domestic, life, and destroy immense numbers of young game. The rodent mammals, such as rats, mice, gophers, rabbits and woodchucks, cause an annual loss of many millions of dollars. In the United States, the annual loss is estimated at \$96,892,000 for rodents by C. Hart Merriam, while \$13,844,000 is the amount of the loss ascribed to the depredations of carnivorous mammals on domestic animals alone. The destruction of young wild life is said to amount to several millions of dollars annually. There is no scientific body in Canada at the present time studying these problems. We have a number of entomologists, but no students of these biological problems in general.

**Northwest
Territories** At the present time, the northern portion of Canada—the Northwest Territories—is unorganized territory, and is one of the richest game areas in the world. It was an animal sanctuary until recently, but it is being traversed by trappers, naturalists and hunters more and more. It is desirable that the Federal Government take a more active interest in the game and fur-bearing resources of this locality, as it is evident they have authority to do so. The number of caribou in this district is estimated by E. Thompson Seton at thirty million head; that is they exceed the number of buffalo at any period. The musk-ox, also, will soon disappear, before our Arctic adventurers. It is considered by many that a system of game

sanctuaries might be established where forest and game protection could be prosecuted as joint enterprises.

The beaver, once the most valuable of Canada's exports, is disappearing before the advance of civilization, and nothing can prevent its extinction on this continent except a system of national reservations. It disappeared in Great Britain in the sixteenth century and will disappear in America in the twentieth, unless national provision is made for its protection.

Experiments Needed The success in farming the fox and the partial success already achieved in farming the mink, marten, fisher, muskrat, otter, skunk, racoon, deer, elk, wild duck, Canada goose, pheasant and partridge, open up a vast field for investigation. It is probable that with man and nature working in some kind of co-operation, all the above-mentioned animals can be propagated, and that their kind can be largely increased in number. The enthusiasm aroused in the problem, because of the success in fox-farming, should be utilized by the intelligent direction of a Federal scientific body. This is a problem of domestication and, as such, is a Federal, as well as a provincial question. The United States Government has this year begun experiments in farming the marten and the mink. It has also been breeding blue foxes for years with success, and has done much to increase the number of Alaska fur-seals during the past year, so that the early restoration of the herd seems probable. Russia is investigating the problem with a view to early action and already has held a convention of karakule sheep breeders. Why should not Canada move in this important matter when she holds a large area of good fur-producing territory?

Exotic Species The importation of exotic species of animals, as, for example, the Siberian marten or Russian sable, the karakule sheep, the yak, the reindeer and pheasants, is another question federal in nature, which should be studied by a Federal scientific body. If Russia can import our improved strain of silver foxes, why can not we import their more valuable sables, or their karakule sheep and, perhaps, eventually, build up a large fur-producing industry with these animals? The reindeer, first imported by the United States Government for use in Alaska, has proved useful in solving the difficult transportation and food problems of remote localities in Canada. Likewise many other species of exotics may become of value in Canada. At any rate, many Canadians desire to attempt to rear wild animals, if only the advice and assistance of a competent Federal body can be secured.

Scarcity of Furs A great change has taken place in the fur trade during the past twenty years. There is a tremendous increase in the demand for all furs and a large decrease in the supply of high-priced furs. It is probable that certain species will never sell as cheap again and that others, such as skunk, muskrat and mink, considered of little value ten years ago, will remain permanently valuable. With the remotest hunting ground of the earth exploited by trappers, something must be done to increase the quantity of fur; or, stated in another way, the rising prices of certain skins make the discovery of methods of breeding a practical problem. Few, if any, of the fur-bearers, except silver fox, would have been remunerative if bred in confinement twenty years ago; but if the advance in prices continues, almost every Canadian fur-bearer will soon pay for its keep.

A considerable part, probably one fourth, of the forthcoming report on fur-farming is an account of the methods of marketing, dressing, dyeing and selling raw pelts. This information is valuable because many mis-statements respecting the supply of furs and the sales of them are made by promoters of fur-farming companies.

Prices of Black Fox In 1910, the silver or black fox was first sold for breeding purposes to the general public, when prices of \$3,000 to \$4,000 a pair were received, or an amount about equal to their skin value. In 1911, the price rose to \$5,000 a pair, and, in 1912, the range was from \$8,000 to \$12,000. All these quotations are for September, October and November delivery of young unproved breeders. In the winter of 1912, one pair of proved breeders was sold to an association for \$20,000, and the offspring of this pair were sold in September, 1912, for \$20,000. At the present time, several companies are freely selling stock in selected breeding foxes capitalized at from \$25,000 to \$31,000 a pair.

The consensus of opinion obtained from various furriers is that the intrinsic value of a silver fox skin is about three times as great as that of a red fox. From this point of view silver foxes for breeding purposes are now selling at a tremendous premium. At least a part of this premium can be justified because:

1. Proved breeders are now more valuable than pups.
2. The littering season is near.
3. The number of silver foxes is very small and the demand is keen.
4. In many instances, guarantees are given with sales.
5. Expert breeders are few in number and their services are valued highly.

Many people, however, are investing money in foxes recently captured, which have poor fur quality. The owners of most of these will receive a rude shock when they market their skins and receive their cheques.

While silver fox is merely a luxury, it has always been in great demand at very high prices, its scarcity contributing to the continual rise in price. It is useless to forecast the future demand for this commodity. No one can estimate what it will be. Speculation as to the future value of silver fox fur is useless. Investment in fox farms is highly speculative.

The Commission took recess.

Tuesday Afternoon Session

The Commission resumed at 2.30 o'clock, Dr. J. W. Robertson in the chair.

THE CHAIRMAN: I shall now call upon Dr. J. P. McMurrich for his illustrated address on the salmon fisheries of British Columbia.

Salmon Fisheries of British Columbia

By

DR. J. P. McMURRICH

Director, Anatomical Department, University of Toronto

MY interest in the salmon fisheries of British Columbia resulted from a visit paid to the Coast four years ago, with the same result that follows the visit of everybody there during the run of the salmon. One cannot help being struck with the prolificness of the fish and the value of the salmon industry to the West coast and to Canada as a whole. When one enters one of the canneries and sees thousands of fish lying on the floor waiting to be put through the machinery and to be canned, one cannot but be struck with the enormous supply of fish which there is upon that coast, and when one commences to enquire into the history of the fish, one is surprised to find that so very little is known about it. From 1908 to 1911 inclusive, the average value of the salmon caught and canned in British Columbia annually, was considerably over \$7,000,000. Some years are better than others but we know very little about the conditions which cause the variations. We know that the fish come to the fresh water to spawn. We know fairly well



FLOOR OF A BRITISH COLUMBIA SALMON CANNERY DURING A 'BIG RUN' YEAR

their life history during the time they are in fresh water, but, beyond that, very little; they soon disappear from fresh water and are lost sight of. Then, in time, they reappear at the mouths of the rivers on their way to the spawning grounds, and we catch them as they are going up to spawn.

Salmon very Prolific I want to throw on the screen one or two views showing typical scenes in connection with the canneries and the run of the fish. This first picture (facing this page) is the floor of one of the canneries during a big year. There are 40,000 salmon lying there on the floor, waiting to be put through the machinery and to be canned. These are sockeye salmon and this picture gives an idea of the enormous number of fish taken in one of the big catches. When the fish migrate up the river, one can see the white spots along the shore, indicating the fish as they go up the river in enormous numbers. The Fraser is the most important of all the salmon rivers in British Columbia. Even from the train, although the track is high above the river on the bank of the Fraser cañon, one can look down and see the salmon in the shallows along the shore, not always heaped up as they are in this picture, but yet in enormous numbers.

Finding that this was the situation, that we knew so little about the life history of the salmon, it seemed that it would be an advantage to endeavour to find out a little more as to the history of these fish. I was fortunate enough to be able to take advantage of the Biological Station that has been established in British Columbia, at Departure Bay, Vancouver island, and I made that my headquarters last year and the summer before, making trips from there to various parts of the coast where conditions were favourable, in the endeavour to obtain material for a study of the life history of these fish. One person cannot do much in one summer; the problems are complex and require a staff of competent men to work at them for years, but I thought it was important to make a beginning and so, as a start, endeavoured to concentrate my efforts, to a large extent, upon the question of working out the life history of the fish; in other words, to determine the age of the fish when they returned to fresh water.

Salmon Fishing Grounds The conditions are different on different portions of the British Columbia coast. Here I show you a rough map of the coast and you may see that the Fraser river enters the gulf of Georgia at the lower end of Vancouver island, near the United States boundary. From that, the Fraser extends northward to Stuart lake, not far from the head waters of the Skeena, and the fish

pass the whole way up, spawning in the upper lakes and in all the streams entering the Fraser. Those that spawn in the Fraser river and its tributaries make up the larger proportion of our catch. There are also, at various points on the coast, deep bays and inlets into which the fresh-water streams run, and into these, too, the fish enter in large numbers. This applies to Rivers inlet, Dean channel and Bellacoola, the Skeena river up to Babine lake, and the Nass river.

**Periodicity
of Salmon
Run** The conditions in the section north of Vancouver island are entirely different from those to the south. It has been found that in the Fraser river there is a remarkable periodicity in the runs, the fish running in large numbers every fourth year, and in the intermediate years in much smaller numbers. This is shown by the pack. As far back as 1893 four hundred thousand cases were packed. Then, the pack falls for the next two years, and the following year declines still more; while, in 1897, there is a rise to over eight hundred and thirty thousand cases. In 1898, 1899 and 1900, the pack was small and, in 1901, it ran over nine hundred thousand cases. The next year, there is a tremendous drop, and, in 1904, the number of cases declined to approximately seventeen thousand. Then, in 1905, it rose again. In 1909, there was again a similar rise to about six hundred thousand cases, and then, in the last three years, it has been very low, but next year a very large run is expected. Although a very marked periodicity, a four-year period, as it is called, exists in the Fraser river, it does not obtain in the northern rivers, at Rivers inlet, or Bellacoola, or on the Skeena. The catch in these shows fluctuations but does not indicate the marked periodicity apparent in the Fraser river catch.

**Determining
Age of Fish** What I have just said refers to one variety of salmon, the sockeye. We have six different varieties of salmon on the Pacific coast, five belonging to a genus quite different from the Atlantic salmon, *Salmo salar*. The Pacific salmon belong principally to the genus *Oncorhynchus*, whose five species form the main bulk of the salmon pack, and of these the sockeye is the most important to us, although in the Columbia and Sacramento rivers the spring salmon is the most important one. In connection with the sockeye, we have indications of a four-year cycle, a very interesting condition of affairs. With regard to another one, the humpback, we have indications of a two-year cycle; that is, every alternate year the humpback are more abundant than in the intervening years. We have these two data to form a foundation from which to work. In the case of the

sockeye, the four-year periodicity may be supposed to represent the life of a generation of fish, four years elapsing from the birth to the maturity of the fish. This, of course, is largely conjecture and it occurred to me, that it might be useful, to find out, if possible, whether there were any anatomical peculiarities in the fish which would give a basis for making definite conclusions as to their history. Thinking this over, I recalled the fact that many years ago, the European carp had been studied very closely with regard to its scales. The scales of many fish have definite markings, somewhat like the rings in a section of the trunk of a tree. The carp, of course, being bred artificially in fresh-water ponds, it was possible to determine the age of a given fish, and, by comparing the scale markings with the age, it was found that the two agreed very closely, so closely, in fact, that the markings on the scales taken by themselves gave an accurate idea of the age of the fish. Thus, then, we have a method for determining the growth and age of the fish, and I determined to apply the method to see if it would work out with the British Columbia salmon, especially as it had been found to work very well on the Atlantic salmon. I endeavoured, accordingly, to obtain as many different sizes of fish as I could and to collect some scales from each, and then, having made preparations of the scales, to study their markings.

Species of
Pacific
Salmon

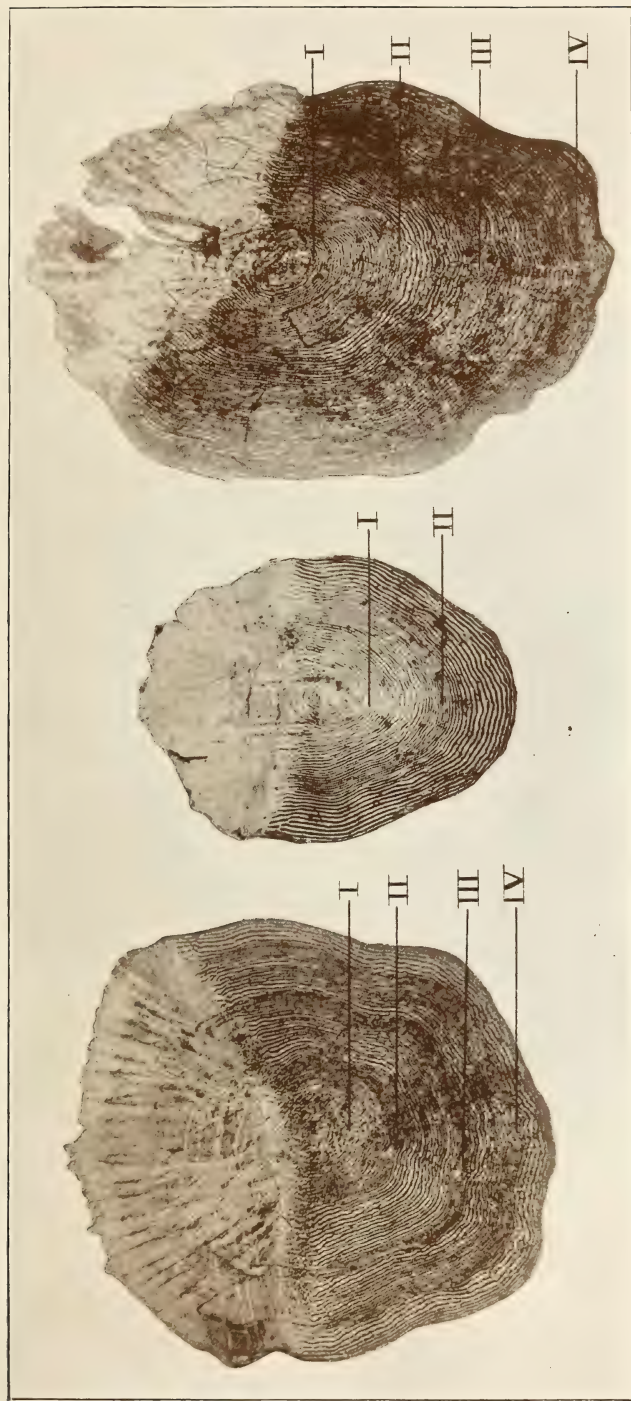
But first let me point out that we have on the Pacific coast five species of the genus *Oncorhynchus*. First, there is the ordinary Pacific salmon, the sockeye. The second is the spring, or California salmon, which grows to a large size, and is the largest of all this salmon group. The third is called the dog salmon, which is very little used for canning since it runs late in the fall and is in bad condition when it reaches the rivers. The Indians use it, and I believe it is now being put up for export to Japan and China; otherwise, it is very little used. Then the coho is, in our waters, the next most important to the sockeye, and, finally, there is the hump-back, so termed because, as it returns to the river, it develops a peculiar hump on the back. As soon as the hump develops, the fish is of little use, but, before that, it is excellent. Of these five species, I was able to obtain fairly sufficient material for the study of their scale markings; of the sixth form, a true *Salmo*, the steelhead, I do not intend to speak on this occasion, although I was able to obtain sufficient material last summer to work out its history, which is, apparently, slightly different from that of the others.

SCKEYE SALMON

Scale
Markings

I now throw on the screen, a picture (Figure 1) which represents a scale, largely magnified, of a sockeye, taken from a fish that was entering the river to spawn. You will notice that there is an area of the scale which is smooth. That represents the exposed surface; all the rest is overlapped by the next scale above, so as to be protected, and, on the covered area of the scales, the markings are visible. There is a nucleus for the scale, which represents the embryonic scale and, by further growth, additions are made to this, each year being represented, not by a single ring, but by a group of rings. At first, the rings are close together. Then, there is a series of rings comparatively far apart, and in the next area, the rings are closer together. Then they separate, then they come close together, then they separate and then they come close together again, and, finally, they separate again. From a comparison with what is known of other fish, it is very clear that the very close rings at the beginning represent the period of the young fish's life spent in fresh water. They represent the growth of the young fry, after it has left the egg, and until it goes to the sea. All these fish spawn in fresh water, late in the autumn. They hatch out in the winter and remain in the fresh-water streams and lakes until April or May of the following spring, and then they start for the sea. That period represents the first winter of the fish's life. It goes to the sea, and we lose sight of it; we do not know where it stays in the sea, what it feeds on, or anything about it, but evidently it reaches conditions in which it grows very rapidly. Thus it is that we must interpret the broader spacing of the rings succeeding the fresh-water area, and that condition continues all through the first summer in the sea, until, finally the cold weather begins and there is a check in the growth. The rings still continue to form, but are closer together. Consequently, by comparison with other fish, we have reason to interpret these narrow rings as representing the first winter spent in the sea. There is one winter spent in fresh water, then a summer in the sea, then another winter and a second summer in the sea. Then there follows the third winter and the third summer, then the fourth winter and we catch the fish in its fourth summer, as it comes back to spawn.

The fish are mature in their fourth year. In other words, the fish that will be caught in 1913, the run of this year, come from fish that spawned in 1909. These fish reached the head-waters of the rivers, they spawned there, and then the fry went to the sea in the spring



SALMON SCALES

Fig. 1.—Scale of a Sockeye, 76 cm. in length.

I. Close of period spent in fresh water.
II, III and IV. First, second and third winters in the sea.

Fig. 2.—Scale of a Grilse Sockeye.
I. Close of period spent in fresh water.
II. Winter spent in the sea.

Fig. 3.—Scale of a Spring Salmon, 82.5 cm. in length.

I. Close of period spent in fresh water.
II, III and IV. First, second and third winters spent in the sea.

of 1910. They spent 1910, 1911, and 1912 in the sea, and will come back in the summer of 1913, constituting a big run. Thus it is certain that this fish has a four-year period, and, as it is well known that practically all the fish die after spawning, the length of a generation of this species is just four years. It is rather interesting to find that the markings upon the scales coincide so exactly with the cannery statistics. We have proof from what we know as to the significance of these markings, that there is this four-year cycle in the life of these fish, and the cannery statistics bear out the story that is told by the markings on the scales.

That is the history of the sockeye, which is the principal fish not only on the Fraser river, but also on our western coast. However, there is occasionally a peculiar modification of this story. During the run, when the fish are coming up to spawn, the canners catch quite a number of under-sized fish. The ordinary sockeye averages seven or eight pounds in weight, and measures somewhat over sixty centimetres in length, but, during the run, a certain number of very much under-sized fish are caught and these correspond to what we call, in the case of the Atlantic salmon, the grilse. They are mature fish and, until last year, I think everybody believed they were male fish exclusively, but I notice in a report from the manager of one of the hatching stations that some female fish of this small size had also been observed. In order to obtain some of these grilse, I visited a cannery supplied from a trap. The picture (Figure 2) which I now throw on the screen, represents the scale of one of these fish. One sees the nucleus, then the fresh-water rings, then those of the first summer in the sea, and those of the first winter in the sea, those of the second summer in the sea—but nothing follows. These under-sized fish, although mature, are precociously mature, being only two years old. They correspond, in other words, to the Atlantic grilse. These latter are known to be three-year-old fish, because the conditions are a little different, but they exactly correspond to this condition. So here we have a piece of evidence confirmatory of the other as regards the accuracy of the scale markings. These under-sized fish are only two years old; they have come back in the middle of their period of life, but, for some reason, they are mature.

SPRING SALMON

The next picture (Figure 3) represents a scale of the so-called spring salmon, known in United States waters as the Columbia, Chinook or king salmon. Here, again one sees portrayed on the scales the fresh-water period, the first summer in the sea and the first winter in the sea,

the second summer and winter, then the third summer and winter and we catch the fish in its fourth year. The spring salmon has exactly the same history as the sockeye, but an interesting point about it is, that, whereas the sockeye runs fairly uniform in size, seven or eight pounds, the spring salmon varies from seven or eight pounds up to twenty, thirty, or even seventy pounds. Yet fish which are ten pounds in weight are of the same age as those which are seventy pounds, judging from the scale markings, and I think there is sufficient evidence of the accuracy of these. It is a question of food, of nutrition, not of living an extra year or so. A spring salmon of seventy pounds is of the same age as one of ten pounds; the size of the fish does not matter so far as the life period is concerned, and their life history is the same as that of the sockeye. They spend their first year in fresh water, they spend three years in the sea, and come back in the fourth year, and, just as we have grilse sockeye, so we can have grilse spring. The scale of such a grilse shows just what the scale of the grilse sockeye showed; the rings represent a period of two years, and he was caught in his second summer. So here, again, in the case of a four-year salmon, we have a certain number of fish, a small number, returning in their second year, mature. Why they are mature, I do not know, but the story is just as true in this case as in that of the sockeye.

DOG SALMON

The scale which I now show you (Figure 4), was taken from a large dog salmon, and the story is, again, just the same. One sees the narrow and broad rings, representing the four years in the same way. So these three varieties of salmon, the sockeye, the spring and the dog, the two most important and the worthless one, have exactly the same history. The dog salmon runs very late in the fall, when the changes which accompany sexual maturity have very nearly reached their completion, and they enter the small rivers. The sockeye, on the contrary, will run hundreds of miles from the sea, and the spring salmon a thousand miles. They may be found at the Whitehorse rapids, on the Yukon, thousands of miles from the sea, and they may be found in the centre of Idaho. But the dog salmon does nothing like that; he keeps rather to the small rivers which do not go up very far and he comes late. Not only is he the last fish to run, but he is in a poor state when he arrives.

DR. ROBERTSON: Are there any data showing whether a two-year-old that has spawned, ever goes back to the sea?

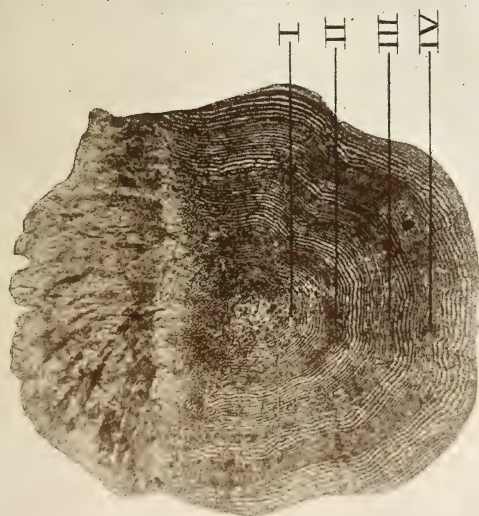


Fig. 4.—Scale of a Dog Salmon, 80 cm. in length.

I. Close of period spent in fresh water.
II, III and IV. First, second and third winters in the sea.

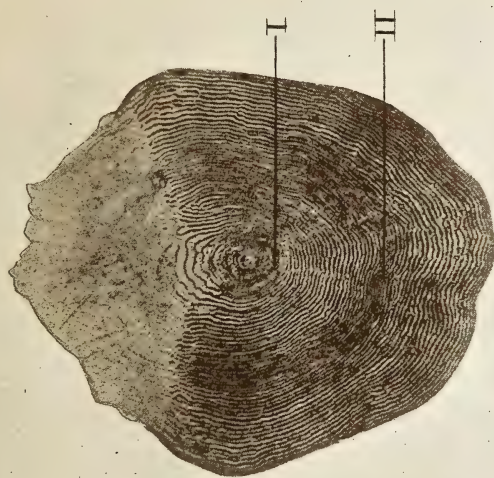


Fig. 5.—Scale of Coho, 74 cm. in length.

I. Close of period spent in fresh water.
II. Winter spent in the sea.



Fig. 6.—Scale of Humpback, 54 cm. in length.

I. Close of period spent in fresh water.
II. Winter spent in the sea.

SALMON SCALES

**Spawn
Only Once** DR. McMURRICH: In the scales taken from one dog salmon there was quite a gap in the series of rings. The zone which represents the first winter in the sea was followed almost immediately by that which represents the second, and the interval which should have shown a lot of rings of the second summer was a blur. From what is known as to the meaning of similar markings on the scales of the Atlantic salmon, I interpret this as showing that this fish had spawned as a grilse in his second summer and had then returned to the sea. But last summer, I made a special study of a considerable number of dog salmon to determine if this behaviour was of frequent occurrence, and was forced to the conclusion that, as a rule, these fish spawn but once, though occasionally they may spawn twice by coming in as grilse and then returning to the sea. The dog salmon has the best opportunity for that, because they seek the shallow rivers near the sea, while the others, when they have spawned, are in too poor condition ever to go back over the long journey they have made from the sea.

COHO SALMON

When I came to study the coho and humpback, the story was very different. This picture (Figure 5) represents the scale of a coho. These fish grow to almost the same size as the sockeye, and are a very valuable fish. One sees the fresh-water growth as shown by the small rings, also the first summer in the sea, and a winter. But the markings of the rest of the scale are exactly like those in a grilse; there are no winter marks showing a third and fourth year. They are two-year-old fish when they run; they are grilse, and never grow beyond the grilse stage. Some of my friends suggested that I examined only grilse fish, but, last summer, I selected twenty or thirty of the largest coho I could find and they showed exactly the same conditions in every case. No coho ever grows beyond his second year; they are all two-year-old fish; they are all grilse, or what corresponds to grilse in other species. Clearly, only one winter has been spent in the sea, judging from the markings of the scale, and I think the conditions shown by the scale are absolutely beyond question.

HUMPBACK SALMON

The same is true of the humpback, which has a smaller scale than any of the other salmon. In the scale which I show you (Figure 6) there was an injury to the young embryonic scale so that the fresh-water

rings do not show clearly, but one sees those representing the first summer in the sea, those showing the first winter in the sea, and then those showing the second summer in the sea, the fish being caught in his second year. The adult humpbacks are two-year-old fish and they are grilse also.

So the coho and the humpback are two years old when mature, and the other varieties are four years old. It is rather interesting to see how this is confirmed by the cannery statistics on the Fraser. According to cannery statistics, the sockeye has a periodicity of four years, and, although the statistics do not show it quite so clearly, the cannerymen believe there is a two-year periodicity for the humpback. That is because they are two-year-old fish. The large run of humpback in 1909 and in 1911, and every two years, is what should be expected; we may expect a large run in 1913. That will correspond with a big run of sockeye, unless the conclusions drawn from the scale markings and from the cannery statistics are erroneous.

The idea I had in mind in undertaking the work the
**Problems to
be Solved** main results of which I have just described, was that what we needed first of all, was a definite basis for work on the entire life history of the fish. If we could be certain as to some facts, we could start from these and go on. The whole story is very complicated; there are very many questions to be determined. What is the cause of the deterioration of the fish at the time of maturity? Why do the muscles undergo fatty deterioration as the reproductive organs approach maturity? What is the nature of the colour of the flesh and why does the colour vary? What is their food when in the sea? We do not know exactly where the four-year-old fish are or anything of their life history during the three years spent in the sea. What I have endeavoured to do is to make a beginning, to get some definite data from which to proceed. That, I think, I have accomplished.

As to the future of the salmon industry it is difficult to make any predictions. We have, it is true, the records of the canneries and these furnish some basis for predictions, but, for several reasons, they do not show exactly what we want to know. In the first place, we must distinguish between the canning on the northern rivers and that on the Fraser river. The division of British Columbia into districts for the compilation of fishery statistics, does not do so, because a large number of Fraser River salmon are taken by canneries on Vancouver island, which are included in an entirely different district from those on the Fraser river itself, and so a certain part of the Fraser river run

is credited to District No. 3, while the greater part of it is credited to District No. 1. The matter is complicated still more by the catch including not only sockeye but other varieties as well. This is becoming a more important factor in the industry every year. The canners have erected enormous plants along the coast, and in the poor years, they cannot get enough fish to keep their plants running. Last summer during a visit to Steveston, I found that they were taking only enough fish to keep their plants running in the forenoons. The result is, that many are catching fish of the poorer grades, putting up coho, humpback and even dog salmon, to keep the plants working.

Then there is another complicating factor being introduced. Cold storage plants are being erected. A magnificent cold storage plant with the most modern equipment was built last year at Uchucklesit on the west coast of Vancouver island and there is also a very fine plant at Prince Rupert. These are taking the place, to a certain extent, of canning, the fish being exported as cold storage fish. This, again, complicates the statistics for our purposes.

Diminishing Supply Although it is difficult to get statistics that are exact, in so far as they do go and if we can trust the accuracy of those of the earlier years, it seems that the number of fish being caught is diminishing. Because there is a four-year periodicity we can compare only the catches of every fourth year, but, if this be done, it indicates that, apparently, the number of fish caught from the Fraser River run is diminishing. The canners are increasing the number and size of their plants and the number of their boats, and they are thus contributing all the more rapidly to the extinction of the supply. The fish have the benefit of close seasons and other restrictions, but even so, the supply is becoming less. This is only an inference—I cannot state it positively—but it is my opinion, and, I think, the opinion of most of the canners, that the supply is diminishing.

International Considerations The question, therefore, is: What can we do to conserve this enormous industry, the most valuable industry the Pacific coast has? I cannot suggest anything very definite, but I want to point out one serious difficulty in the way, a difficulty very similar to that mentioned this morning in connection with migratory birds; it is that the United States has a very large interest in the Fraser River catch. The bulk of the fish coming to spawn in the Fraser river come up the south shore of the gulf of Georgia, and on that shore, there is cannery after cannery catching them. Up to 1908, the Canadian canners on the Fraser were catching more

than the Americans, but now the Americans are catching more than twice as many as the Canadians. Last year, if I remember right, the canneries in the state of Washington put up more than a million cases of fish, while the Canadian canners of the Fraser river put up five hundred thousand. The fish caught by the Americans are all fish coming in to spawn in the Fraser river; they are our fish, but they are in territorial waters in Puget sound, and we can do nothing about it. Any arrangement that is made looking to an improvement of the conditions must be a mutual one. The Canadian canners especially are feeling the pressure; the Americans are catching more fish, because they get the first chance at them. We have to take what is left, although they are fish that spawn in our waters. It seems to me that, in view of the possibility that the supply will run short, the condition is one that requires careful consideration. The Canadian canneries are putting up the poorer fish; the situation is being changed by the erection of the cold storage plants—all these facts indicate a diminution in the supply of fish, and the canners realize that it is likely to occur.

Whether anything can be done to prevent it, remains to be seen. Artificial propagation, of course, suggests itself. The Canadian government is now hatching salmon for the United States canners to catch. I am willing that they should do so, and it must be said for the American canners that they are willing to take part in the hatching, but there are difficulties in the way. Can we allow American firms to erect hatcheries on our territory and breed our fish? And, furthermore we do not know how much good the artificial hatching does. There is no way of determining that; probably it has done some good, but we cannot tell. If anything can be done to preserve the Fraser River fisheries, which are the most important, it must be done by arrangement between the United States and Canada. Of course, we have absolute control of the northern waters; there we are dealing with fish which never go into United States territorial waters at all, and we can control them as we please.

I shall not go into the question of the laws that have been proposed. They are very good as far as they go, but they do not go far enough. What we ought to have is a run every year as good as that of 1905, in short, to have a big run every year. There is no reason why we should not do that provided the canners agree to stop canning in one of the poor years and allow all the fish to go up to spawn instead of catching them by thousands. By repeating this at intervals in the other poor years, the fish in the three poor years would probably be just as abundant as they are in the year of the big run. At present at the mouth



SALMON FLEET, FRASER RIVER, B.C.

The salmon fishing industry on the Fraser is one of great value. It will probably be destroyed unless Canada and the United States can arrive at some agreement to prevent the wholesale catching of the fish before they enter the river to spawn.

of the Fraser river, the nets form a veritable barricade, one net overlapping the next all the way from New Westminster to the mouth. In the poorer years, every fish is caught that can be caught in the open season, and the poorer the year the more danger there is of the run of fish for that year being almost ruined. What is needed is a different set of regulations for different years. A set of regulations applying to all years indifferently will not prove effective. What is needed is more intelligent control of the situation both on the part of the state of Washington, the United States, and the Dominion of Canada. That intelligent control can come only from a careful and thorough study of the entire life-history of the fish:

DR. FERNOW: The determination of the age of fish by the rings on their scales reminds me of the way that the age of trees is determined.

THE CHAIRMAN: We shall now have the report of the work done by the officials in connection with the Committee on Waters and Water-powers. Mr. Leo. G. Denis will first give an account of his work.

WATERS AND WATER-POWERS

MR. DENIS said:

Water-
Works of
Canada

During the first part of the year a large amount of time was devoted to a report on the Water-Works of Canada.

The information which had already been obtained by correspondence was supplemented and brought to date. In some instances, to accomplish this, it was necessary to visit several towns in Ontario and Quebec and obtain from them data which could not be obtained by correspondence. This report is now in the printer's hands and will be ready for distribution in a short time. It contains a summary description of the water-works systems of Canada, all arranged for ready reference. A portion of the report is devoted to charts and tables emphasising points of special interest, such as increase in the number of water-supply systems, rates, sources of supply, consumption per capita and sewerage conditions.

Water-Pow-
ers of West-
ern Canada

To obtain further information for the proposed report on Western water-powers, a trip was made to the northern portions of the provinces of Alberta and Saskatchewan, to investigate water-power possibilities. The principal rivers travelled over were the Peace, Slave, Clearwater, Methy and Beaver.

I left Ottawa on June 16th and reached Edmonton on the 19th. I found that the Hudson's Bay Company's steamer was only due to

leave Peace River Crossing for Hudsons Hope, my first objective point, on July 10th. From Edmonton, where railway travel was abandoned, until the Canadian Northern railway was reached at Big River, I travelled a total distance of 2,100 miles, of which 1,000 were by river steamers, 850 by canoe, and 250 overland, where the mode of transportation varied from automobiling to footing it behind a team of oxen.

Peace River Canyon I left Edmonton on June 25th, passing through Athabaska Landing, thence by steamer and stage to Grouard and Peace River crossing, arriving at the Crossing on July 3rd. I left for Hudsons Hope on July 17th, arriving at the latter place on July 25th. As a very complete survey of the Peace River cañon had been made during the previous summer by Mr. G. B. Milligan, it was not necessary to make the proposed survey, Mr. Milligan kindly supplying a plan of his survey. As no levels had been taken, however, the portage was traversed to the upper end of the cañon, aneroid readings were taken for difference of levels and the cañon was explored for a few miles at each end. The descent of the water in the cañon is fairly uniform, except near the head where there is a descent of 25 feet in a half mile. The total descent from head to foot is 225 feet in 18 miles.

Vermilion Fall and Rapid Leaving Hudsons Hope by steamer on July 27th, Fort Vermilion was reached on August 1st. Here men were secured and on August 5th we started down the river for Fort Smith. Next day the Vermilion fall and rapid were measured. The descent in the rapids is 14 feet, while that in the chute is 12 feet, giving a total of 26 feet in a distance of $1\frac{3}{4}$ mile.

The Boyer or Little rapid was measured on the 9th, and we reached the mouth of the Peace river on the 11th and Smith Landing on the 13th. During the whole trip from Fort Vermilion we were much delayed by heavy head winds and, at times, had to 'track' in spite of the fact that we were descending the river.

An Upset At Smith Landing, I found that, to level the descents between that point and Fort Smith, it was necessary to run the rapids, as, from the Sixteen-mile portage road, the river is inaccessible, except in a very few places. I accordingly hired a local guide and started down the rapids. The channel followed for the greater portion of the distance lies between the numerous islands on the east side of the river and the descent is effected by short pitches, some of which have to be passed by portages. In passing the last pitch



GATES AT THE HEAD OF PEACE RIVER CANON



VERMILION FALLS, PEACE RIVER

of the last rapid, I had the misfortune of having my boat upset, losing several instruments and some personal effects. The whole trip through these rapids, including the time spent in taking observations and levels, took almost two days, after which I returned from Fort Smith to Smith Landing by the portage road.

Rapids of Slave River	The following are the descents observed in each of the		
	five rapids:		
	Cassette rapid	.....	27 feet
	Second “	.....	37 “
	Mountain “	.....	25 “
	Pelican “	.....	10 “
	Drowned “	.....	13 “

The total descent in the 16 miles where these rapids occur, including the swift waters between them, is about 135 feet.

I left Smith Landing by the Hudson's Bay Company's steamer *Grahame* on August 20th and arrived at Fort Chipewyan on the 22nd. Men with provisions and a canoe, who had been sent from Athabaska Landing by my instructions, were waiting for me. Next day, we started by canoe up the Athabaska river, reaching Fort McMurray on September 1st. On the following day, we proceeded up the Clearwater river and reached Methy portage on the 9th. The Clearwater was metered at the Cascades rapid and the descent in the Cascade, Le Bon, Bigstone and Pine rapids and in the Whitemud fall were levelled.

Rapids of Clearwater River	The following is the descent observed in these different		
	rapids:		
	Cascades rapid	.....	16 feet
	Le Bon “	.....	31 “
	Big Stone “	.....	6½ “
	Pine “	.....	21 “
	Whitemud fall	.....	41 “

I sent men over to the other side of the Methy portage for a team of oxen to portage our canoe and provisions and, after unavoidable delay, we finally reached the Hudson's Bay Company's post on Methy lake on the 12th and proceeded down Methy lake and river. The rapids were levelled and the river was metered above the mouth of the Whitefish river. We then crossed Buffalo lake and reached Ile-à-la-Crosse post on September 21st. Here, after purchasing some provisions we started on our way up the Beaver river on the same day, reaching the Grand rapid on September 24th, where levels were taken and the flow of the river metered.

We continued ascending the Beaver river and by way of Cowan river and lake reached Big river on September 28th. We had to wait until October 1st for a train to take us to Prince Albert, which was reached on the same day. From Prince Albert, I sent the canoemen back to Athabaska Landing and left for Ottawa, where I arrived on October 6th.

THE CHAIRMAN: I shall now call upon Mr. Arthur V. White to report on his work on the water-powers of British Columbia.

WATER-POWERS OF BRITISH COLUMBIA

MR. WHITE said:

In presenting a review of the work appertaining to water-powers, done under my direction during the season of 1912, I desire to point out, first of all, that the main work in hand is the collection of information respecting the water-powers of British Columbia, with the object of enabling the Commission of Conservation to publish a report dealing with the water-power resources of Western Canada.

Complicated Situation No other province of Canada is confronted with the problem of adjusting so complex a water situation as exists in British Columbia. In the early 'fifties,' water rights and privileges for mining operations began to be taken up, and, subsequently, other rights and privileges were granted for irrigation in connection with the development of large agricultural areas. All of these rights are now represented by upwards of 5,000 water records, issued under various terms and conditions. In addition, there are others, given later, for water-powers. The applications for waters for all purposes are on the increase. The whole situation is a difficult one, and, until adjudication upon conflicting interests can be had, patience and consideration will be required on the part of the record-holders, and caution, wisdom and courage on the part of the administration. These problems are now being dealt with by the Provincial Government, and, in this connection, two men, experienced in irrigation and water matters in the United States, Dr. Samuel Fortier and Mr. H. W. Grunsky, were, during a part of 1912, engaged in considering ways and means of satisfactorily adjusting some of these problems.

Provincial Co-operation When I arrived in British Columbia I found that the plans outlined for 1912, contemplating as they did a measure of co-operation on the part of the Province with the Commission of Conservation, required some modification. Hon. William R. Ross, Minister of the Department of Lands, said that he desired to extend to the Commission any assistance he could and sug-

gested that I confer with Dr. Fortier and others. A conference was held, and as our plans did not conflict with their work, the Minister's co-operation was extended, the province advancing \$3,450 to cover their portion of the co-operative work. In the United States, much water investigation work is carried on co-operatively between the Federal and State authorities. For example, during the fiscal year 1912, the Water Resources Branch of the United States Geological Survey received for such co-operative work, from the state authorities of California, \$25,500; from Minnesota, \$16,000; from New York and Oregon, each over \$13,000; from Idaho, \$12,500, and from Washington, \$4,400; while a number of other states contributed lesser sums. All the contributing states thus gave a total of nearly \$114,000, and this co-operation has proved of mutual benefit. During 1913, it is expected that a further special appropriation will be made by British Columbia, probably larger than that of 1912.

It might add a little to the clearness of what I am about to say, if I explain what authorities exercise jurisdiction over water-powers in British Columbia. First there is the Water-power Branch of the Department of the Interior, which has jurisdiction over the Railway Belt. In addition, the Department of Lands of British Columbia has a Waters Branch which deals with irrigation, and also a separate Lands Department dealing with water-powers, which reports direct to the Minister.

Railway Belt Water- Powers

In the report of the third annual meeting of this Commission, it is stated that in initiating the water-power investigation in British Columbia it was decided to begin systematically to cover the territorial area of the Province. The area south of the Railway Belt, together with the Railway Belt itself, contains the bulk of the population of the province; it also comprises the water-power possibilities of more immediate economic importance, and, consequently, the investigation was commenced in these districts. A large part of the Province south of the Railway Belt, in 1911, was examined by the engineers of the Commission.

Through the courtesy of the Water-power Branch of the Department of the Interior, the hydrographer of the Railway Belt, Mr. P. A. Carson, has, during 1912, carried forward an investigation in his territory, and the principal field data respecting the water-powers in this area have been assembled. I understand most of these data have been reduced to a form readily adaptable for inclusion in the proposed water-power report. We are indebted to Mr. Carson, and his engineers, Messrs. C. G. Cline, C. E. Richardson, E. M. Dann and H. S.

Keys for their assistance and also to Mr. J. B. Challies, Superintendent of the Water-power Branch. The Kamloops hydrographic office has had a heavy task with its own irrigation and other work, and notwithstanding this, extra effort was made by its staff to further the early collection of water-power information that had been requested. They have secured hydrographic data, including measurements of stream flow, for some of the large rivers, such as the Fraser, the North Thompson, the South Thompson, the Columbia, and the Adams.

**Columbia
River
Survey**

The Department of Public Works, Canada, in 1912, commenced an instrumental survey of the Columbia river around the 'Big Bend.' Through the courtesy of the Department, and the district engineer directing the survey, Mr. F. W. Aylmer, it was arranged that the Commission of Conservation might attach a man to this survey party, that he might make water-power investigations of the tributaries of the Columbia, using the main survey party as a base for operations. Meantime, however, a new water-power organization had been effected in the Lands Branch at Victoria, and Mr. G. Gray Donald was placed in charge of water-power work. As he desired to make some surveys on the Columbia, it was left for him to avail himself of any co-operation with Mr. Aylmer's party that might seem desirable. Mr. Gray Donald also commenced instrumental surveys of the Pend'Oreille and Kootenay rivers and the results will, later, be available for our report upon the water-powers of Western Canada.

**Forests
Branch
Co-operation**

The Forests Branch of British Columbia has just organized an extensive, systematic survey of the forests of the Province, and the chief forester, Mr. H. R. McMillan, has arranged to have the skilled men engaged upon this special survey, report specifically upon water-powers observed, if, after trial, such work is found not to hinder the progress of his own surveys. Mr. H. K. Robinson, who is initiating this forest survey work in the field, informed me that his assistants seemed much interested in the water situation, and were ready to co-operate in supplementing their forest reports with data relating to water-powers.

**Co-operation
of Surveyor-
General**

The Surveyor-General of the province, Mr. G. H. Dawson, has instructed British Columbia land surveyors, who are executing the provincial land surveys, to send in information relating to water-powers. It is to be supplied upon special forms which, however, are not returnable to the Surveyor-General until later in the year, when the surveyors are handing in their survey reports. We are also indebted to the chief geographer, Mr. G. G.

Aitken, who has very kindly assisted us with blue prints, and with advance copies of the new map of British Columbia.

Co-operation of Waters Branch In the Waters Branch, B.C., through the courtesy of the Acting Chief Comptroller, Mr. J. F. Armstrong, there is now being compiled a complete, brief tabular synopsis of all the records and water reservations issued in the Province. These water records, as above intimated, constitute really the underlying basis of the water situation and, in many cases, they conflict with the possible development of power on streams to which they appertain. This tabulation will be available for our proposed report, and will constitute a valuable basic record.

Electric Inspection Branch Co-operation The Electric Energy Inspection Branch of the Department of the Attorney General of British Columbia, under the superintendence of Mr. D. P. Roberts is co-operating to secure some desirable information relating to the hydro-electric power companies now operating in the province.

Survey of North Thompson During 1912, a firm of engineers were conducting a railway survey and taking levels down the North Thompson. It was not possible to send a party into this territory, but through the kindness of one of the members of the firm, data was obtained respecting tributaries of the North Thompson. This work was done for a nominal sum.

Data from U.S. Surveys In January, 1913, while in Washington, D.C., at the conference of District Engineers engaged upon stream gauging in the United States, I met the engineers who are conducting water-power investigations in Idaho, Montana and Washington. A considerable body of data will later be available from the investigations of these engineers; especially as a result of the work of 1913. The state of Washington, for example, will investigate the rivers in the portion of the State adjoining British Columbia and the results will be available for our report. They will be valuable since they are derived from territory corresponding in physical characteristics to portions of British Columbia.

Field Operations in 1912 Our own field work in 1912 was commenced in early July in the Cariboo district. Engineers G. H. Ferguson, A. W. Campbell, C. J. Vick, L. G. Mills, and F. Burd outfitted with pack horses and supplies at Quesnel. Mr. Ferguson's previous experience facilitated the securing of horses—an expensive factor of survey cost—at a reasonable rate. Messrs. Campbell and Vick

were each in charge of a sub-section of the work, while Messrs. Mills and Burd acted in the capacity of assistants. A very considerable amount of territory embracing the tributaries of the Fraser river to as far north as the Grand Trunk Pacific railway, was covered. The major portion of the responsibility for this work was upon Mr. Ferguson, and his application contributed much to its success. Representative photographs were secured, those taken by Mr. Vick being especially good. In all about 3,300 miles were travelled by the Cariboo party.

**Mainland
Coast
Survey**

Two parties, each consisting of two men, were despatched up the mainland coast, beginning just north of Powell river. They were instructed to examine all streams entering the various inlets. A 40-foot gasoline launch, the 'Lizette,' was chartered, and outfitted for three months. I regret, however, that the measure of success attained by the West Coast party was not what I anticipated. While work on this coast is especially difficult, and the heavy rains make it necessary to operate under disagreeable and trying conditions, there is often, in such investigations, a temptation to hurry over the ground, although explicit instructions have been given that the work must be done in a thorough manner. Too much time was spent on the smaller streams and the larger ones were not followed far enough up from their mouths, and I now doubt the advisability of sending more than one party in one boat. The basic idea in planning the work was that one party would go up one stream, the other party up another, and the engineer would manœuvre the launch to pick the men up with the least possible loss of time on their return. This interdependence of one party upon another may have had an undesirable influence upon the party that should have gone up their stream farther; and it may sometimes have been difficult to apportion the time to the respective parties. It is estimated that the coast party covered about 3,000 miles, much of which distance was necessitated by the trips in and out of the long inlets. However, considerable data was secured and the deficient information can probably be obtained by a couple of men using the steamers plying along the coast.

The season, during which it is profitable to carry on reconnaissance water-power investigations in British Columbia is comparatively short, and it is almost impossible for observers to avoid over-estimating the power possibilities of streams observed during high stages. Engineers doing similar work in the United States experience the same difficulty, and have therefore been endeavouring to do the work, as much as possible, when the streams are approaching their lower stages of flow.



ONE OF THE CHANNELS OF CASSETTE RAPID, ON SLAVE RIVER NEAR
FORT SMITH



SITE FOR STORAGE DAM AT FOOT OF STUART LAKE, B.C.

**Assemblage
of Data Re-
quires Time** After drawing attention to these matters connected with work performed in British Columbia, and to the efforts being put forth by the various co-operating agencies named, it may erroneously be inferred that much more data is in hand than is actually the case. I have endeavoured to outline the avenues along which efforts have been, and are being, directed in order to secure information, and to indicate the measure of success that has attended these efforts. The majority of persons from whom cognate information must come are pressed with their own matters, and it has been necessary for me to do a certain amount of personal co-operative work in order to secure their co-operation, and to manifest the desire of the Commission of Conservation to assume its own share of the labour of securing information. All these matters take time and the information may be, and often is, delayed. It must be appreciated, therefore, that much of the data above referred to is not yet in hand, but it is gradually coming in.

**Suggested
Surveys on
Vancouver
Island** I had hoped to examine some water-powers on Vancouver island on which there are some important power streams, notably Campbell river, but funds did not permit. I have always felt that a territory so well confined, and relatively of such limited extent as the Island, should not be subjected to the class of reconnaissance investigation that would be justified for larger areas. In the United States, there is an increasing tendency to do preliminary work of investigation of power rivers in a more detailed manner; the streams are profiled, and possible dam sites, and storage reservoirs, are contoured. This results—without undue increased cost—in the production of permanent survey records of enhanced value. I think that Vancouver island presents an excellent opportunity to make an investigation of its rivers in a manner to yield data of a higher standard, and thus leave the work more complete, and an example of what may next be striven for in other parts of the country. I propose to discuss with the Minister of Lands for British Columbia, the possibility of conducting such a water-power survey on the Island, and to undertake at least a portion of this work along the lines just suggested.

In the northern portion of the state of Washington much greater outlay is now being made for water-power investigation and surveys, and it is especially desirable to make corresponding investigations in this country, especially upon waters which flow across the boundary. It is understood, of course, that good judgment is called for in the selecting of where, and in the determining to what extent, such work should be performed.

**Manual of
Instructions**

At the last annual meeting attention was directed to the fact that the Hon. W. R. Ross had said that, if effort were made to create more interest in the general subject of inland water resources, so that fire wardens, game wardens, road superintendents, timber cruisers and others, would be led to a better appreciation of the principles underlying right usage and conservation of inland waters, many such persons might be induced to obtain water-power information, the acquisition of which information might otherwise be delayed. Accordingly, I prepared a small manual, entitled *Instructions relating to the Gathering of Certain Preliminary Information respecting Water-Powers*. It is a brief statement setting forth some requirements respecting the gathering, in the field, of certain data appertaining to inland water resources, and is designed to be a guide to persons who may assist upon such work. This pamphlet was printed by the Province of British Columbia, and half the edition was made available for distribution by the Commission of Conservation. It was used by our own engineers, and distributed to interested persons with whom they came in contact. The pamphlet was also issued to the British Columbia land surveyors, to the Forest Branch engineers, and others. Its value was enhanced by the inclusion of unpublished data resulting from special research made by Mr. R. H. Bolster, respecting the measurement of stream discharge by surface floats. These data were supplied through the courtesy of Mr. M. O. Leighton, Chief Hydrographer, United States Geological Survey. It takes time before the results of some of these pioneer efforts are actually in hand, but the near future will show good results from many of them.

Other Work

During the year I assisted in the preparation of the Chicago Drainage Canal report, and prepared a report dealing with the Long Sault power project. In August, I returned to Ottawa, and spent September assisting upon work connected with the reference before the International Joint Commission relating to a proposed regulation of the level of the Lake of the Woods. In this connection, I attended public hearings at International Falls and Warroad, Minnesota, and at Kenora, Ontario.

**Plans for
Work, 1913**

In 1913, it is proposed to deal with the territory tributary to the Grand Trunk Pacific, and the Pacific and Great Eastern railways, along with the balance of the west coast, Vancouver island, and probably part of the country lying well to the northward of the Grand Trunk Pacific railway.

In 1912, due to the demands of travel, the work was necessarily more expensive than in 1911. Owing to increased freight rates and lack of competition, the prices for food and other supplies increase the farther inland one goes. Take, for example, the parties operating last year in the Cariboo district. The average cost of food per man per day for the Quesnel River investigation was 80 cents; for the Blackwater River district, \$1.00; and for Willow and Bear rivers, \$1.20. A fair average for food for this work would be \$1.00 per man per day. Saddle horses ranged from \$1.25 to \$1.50 per day, and pack horses from \$1.00 to \$1.25 per day. For the most part, the horses grazed for themselves. Hay ranges in cost from \$50.00 per ton upwards, and, in the Chilcotin district, oats cost from \$1.00 to \$1.35 per bus.

In 1913, I expect the field operations may be considerably more costly than in 1912.

THE CHAIRMAN: I shall now call upon Mr. Patton to read the report of the work done last year under the Committee on Press and Co-operating Organizations.

PRESS AND CO-OPERATING ORGANIZATIONS

MR. PATTON said:

The work of this committee may, for convenience, be divided into three divisions: first, the issuing of reports in pamphlet and book form embodying the results of investigations carried on by the staff of the Commission; second, the issuing of the periodical *Conservation* to the newspapers of Canada; and lastly, the providing of speakers to address public meetings on topics relating to the conservation of natural resources.

The work of issuing reports in pamphlet and book form is increasing rapidly. The Committee on Press and Co-operating Organizations is the clearing house for the information gathered by all the other five Committees; all that the latter give to the public must pass through the editorial office. As these five Committees are now fully organized, one investigation following another in rapid sequence, the editorial work will increase in at least five-fold proportion as compared with that of the other Committees.

The following statement shows in tabular form the publications that have been issued during the past year and also gives their size and cost:

PUBLICATIONS ISSUED, 1912

Publication	No. of Pages	No. of Copies	Total Cost*	Cost per Volume
1. Game Resources of Canada (reprint).....	46	1,000	\$ 63.00	\$0.063
2. Third Annual Report	154 + v	10,000	3946.22	.2041
3. Prevention of Pollution of Canadian Surface Waters.....	24	12,000	226.07	.0205
4. Forest Conditions of Nova Scotia.....	98 + ix	13,000	8048.51	.619
5. Chicago Drainage Canal Protest†.....	27	5,957	327.70	.055
6. Supplement to Animal Sanctuaries in Labrador.....	38	3,000	138.00	.046
7. Sea-Fisheries of Eastern Canada.....	212 + vi	9,005	3196.84	.355
8. Ottawa Typhoid Epidemics	11	7,000	118.60	.016
9. Mine Rescue Work in Canada.....	50 + vii	9,000	1195.95	.1328
10. Catalogue of Publications.....	20	1,000	79.00	.079
	Total No. of Copies	Avg. Monthly Circulation	Total Cost	Monthly Cost
Conservation (Monthly).....	18,000	2,250	414.01	51.75
Total.....	.....	74,212	17,723.90	.....

*This includes cost of all illustrations and maps, but not of translation into French.

†The report entitled *Papers relating to the Application of the Sanitary District of Chicago for Permission to Divert 10,000 Cubic Feet of Water per Second from Lake Michigan*, was compiled and edited by the editorial staff of the Commission, although it was issued under the name of the Department of Marine and Fisheries.

A Monthly Paper Last year the Committee resolved to publish monthly for eight months in the year a bulletin for the use of the newspapers of Canada. The editorial staff has therefore issued eight issues of a four-page illustrated paper called *Conservation*. This contains short articles on matters relating to conservation, the pith of reports sent in from field men that have a news value, and articles by the various experts employed by the Commission on abuses that need eradication or methods of exploitation of natural resources that could be improved.

Conservation, it is needless to say, has become very popular with busy Canadian newspaper men. It has proved of so much use to trade newspaper correspondents that they visit the office on the day of publication in order to get a copy as soon as it is off the presses. Its articles are copied widely throughout Canada. Sometimes credit is given for them, more often it is not; but that is a matter of no importance. The important point is that these articles on conservation are placed before the Canadian public.

Conservation was first printed on both sides of the page, but as this necessitated the destruction of an article on the obverse side of a clipping, the printing is now being done on only one side.

The periodical is illustrated with half-tone engravings, most of which are made from photographs obtained by our staff when in the field. Some of these, representing views of various natural resources in newer parts of the country, are not to be had elsewhere. All the half-tones published are loaned to newspapers asking for them. This opportunity has been taken advantage of very generally by editors throughout the country, and the loaning of cuts has become one of the most popular features of the publicity work of the Committee.

Platform Work The Committee has not yet entered upon a systematic and organized platform campaign in the interests of conservation, although the Committee on Lands has found it necessary to do a considerable amount of this work in connection with the illustration farms. Various societies and public bodies, however, apply to the Commission for speakers from time to time and these are always supplied.

DISCUSSION

MR. MACKAY: I do not think I need add anything to what has been said in the report just given. We are proud that the infant born last year has proved so popular. *Conservation* is already an established success in the newspaper offices of Canada. I myself recognize in the

various daily and weekly papers, many clippings from this monthly publication that comes from the Commission's office. I think it is capable of much greater expansion. Twenty-two hundred and fifty copies is a very limited issue to cover Canada; I think it should be sent not only to newspapers and periodicals, but that the field might be widened almost indefinitely by sending it to the schools of the country, mechanics' institutes, labour temples, and other public or semi-public organizations. There is no doubt in the world that people will read a paper of that kind which is of live interest, who will never read the same matter between the covers of a Government blue-book. A short condensation of the report of an expert can, in this way, be put before the people and conveyed to them much more effectually than through the ordinary government channels. If the funds will permit, I think a great extension of the circulation might be made along that line this year.

Co-operating
Organizations I am in happy accord with the suggestion that more should be done in the direction of co-operating organizations. Very little has been done in this way so far. After all, people like to hear the spoken word if it is done properly and with conviction, and, so far as possible, I think the Commission should endeavour to meet the public demand in that direction. Canadian clubs, both for men and for women, have sprung up in large and small places alike, and there is a constant demand for speakers. I am sure that the officers of these clubs would be pleased to hear from any of the officials of the Commission or any friends who have talents along the line of public speaking.

Not only on the platform but in other directions, I think we have opportunity for extending the work of the Commission through other bodies. The Canadian Forestry Association is doing a work of its own but there are other organizations, workingmen's organizations, fish and game clubs, etc., through which a great deal might be done. The Canadian Press Association is being covered by *Conservation*, but there are other organizations with which we should co-operate.

The amount of work involved in our campaign of publicity has been very great indeed. No one understands the amount of work; it has been a tremendous task. But it is not done until we get all that information in the hands of the people. The work of the Committee on Press and Co-operating Organizations is the climax, the key-stone of the whole work and unless that Committee is given a free hand, the work of the whole Commission is stultified.

COMMITTEE MEETINGS

On Tuesday afternoon, meetings of the various Committees into which the Commission is divided, were held for the discussion of the conservation problems with which each has to deal and for the formulation of lines of policy and resolutions to be placed later before the whole Commission for ratification. The following are brief accounts of the proceedings of these meetings:

Committee on Lands The Committee was called to order by the chairman, Dr. J. W. Robertson. The following members were present: Dr. George Bryce, Hon. O. T. Daniels, Dr. C. C. Jones, Hon. J. A. Mathieson and Dr. W. J. Rutherford.

The chairman briefly outlined and explained the work of the Committee during 1912. After considerable discussion, a number of resolutions were adopted for presentation to the Commission. These resolutions are given on page 153.

Committee on Forests The Committee on Forests was convened by its chairman, Hon. W. C. Edwards. As a result of a thorough discussion of the various phases of forest conservation, the resolutions which appear on page 156 were formulated for submission to the Commission.

Committee on Minerals As the Committee on Minerals is without a chairman, Hon. O. T. Daniels acted as chairman of this committee meeting. Resolutions were passed urging the appointment of a properly qualified chairman and advising that, on this appointment being made, a special meeting of the Committee be called to place before the proper authorities the recommendations made in previous years by Mr. W. J. Dick, the Mining Engineer of the Commission. These resolutions appear on page 152.

Committee on Fisheries and Game The Committee on Fisheries, Game and Fur-bearing Animals was convened by the chairman, Dr. C. C. Jones. Besides the members of the Committee there were present for a part of the meeting, Mr. A. E. Arsenault of Summerside, P.E.I., and the members of the Dominion Shell-fish Commission, who wished to ascertain the views of the Committee on several points in connection with the conservation of those fisheries.

Premier J. A. Mathieson, of Prince Edward Island, read a draft of the regulations which were being formulated by the Provincial Government to govern the oyster fishery of that Province, and these

were fully discussed. Resolutions on this and other matters approved by the Committee appear on page 158.

During the autumn of 1912, Mr. M. J. Patton, Assistant Secretary of the Commission, made an investigation of the oyster fisheries of Prince Edward Island, spending several weeks there and visiting all of the chief oyster-fishing centres. A special effort was made to get in close touch with fishermen and dealers in order to ascertain their views regarding the best means to conserve and develop the fishery. Mr. Patton's report, made as a result of this investigation, follows:

Oyster Farming in Prince Edward Island

BY

M. J. PATTON

Assistant Secretary of the Commission of Conservation

DURING the past year the Dominion Parliament waived its claim to granting leases to the oyster areas of Canada, and, consequently, the disposal of these areas now rests entirely with the provinces. The act granting these concessions was passed at the last session of the Dominion Parliament. It empowers the governor in council to "authorize the government of any province to grant leases of such areas of the sea coast, bays, inlets, harbours, creeks, rivers and estuaries of such provinces as the government of such province considers suitable for the cultivation and production of oysters." Thus a way was opened up whereby the disposition of both the barren and the producing oyster areas could be placed under provincial jurisdiction. The provinces were not slow to take advantage of this and Nova Scotia, Prince Edward Island, New Brunswick and British Columbia—all the oyster-producing provinces—have entered into agreements with the Dominion government, giving them the undisputed right to lease the oyster areas within their boundaries. While the Dominion thus relinquished its claim to the disposal of these bottoms, it still possesses the full legislative jurisdiction, as confirmed by the decision of the Judicial Committee of the Imperial Privy Council in 1898, and makes and enforces all laws and regulations under which the oyster fishery is carried on.

**Survey of
Richmond
Bay**

As soon as the agreement with the Dominion was executed, the government of Prince Edward Island took steps to make available to its inhabitants the large areas of potential oyster areas that it possessed. Preparatory to granting leases, Mr. H. H. Shaw, Provincial Engineer, was detailed to make a survey of all the tidal rivers and coastal waters. During 1912 he completed a survey of Richmond bay, which, before its depletion, produced large quantities of the famous Malpeque oysters. It was found to contain approximately 14,700 acres, most of which is available for oyster culture. The plan of survey shows the bay divided into 20-acre plots, each of which is divided into four plots of 5 acres each. The depth of the water at low tide and the character of the bottom are also indicated.

In 1913, additional parties will be detailed to the work, and the survey of the remaining areas completed as rapidly as possible. As Prince Edward Island has a coast line some 800 miles in length, this is a work of no small magnitude.

Leasing Regulations When the survey was nearing completion, the Provincial government formulated regulations for the issuing of leases and in the autumn of 1912 applications for leases of areas in Richmond bay were received. On October 17th, applications were called for from adult persons who had been residents of the Island for at least one year. Riparian owners were given the first opportunity to secure leases of 5-acre plots contiguous to their property, and, after these applications had been filled, the applications of other residents were considered. In the case of two persons, not riparian owners, applying for the same plot and failing to arrive at a satisfactory settlement, the lease to the disputed area was put up at auction and sold to the highest bidder. The time for receiving applications expired on November 20th, but a second opportunity to obtain areas, extending from November 30th to December 16th, was given to residents. This time they were not restricted to 5-acre plots and those who had already been granted leases were allowed to obtain additional areas. After December 16th, applications for leases from non-residents of the Island were considered.

The lease extends over a term of twenty years and, at its expiration, is renewable at the option of the lessee for a further period of twenty years. The rent charged is \$1 an acre for each of the first five years, \$3 an acre for each of the second five years and \$5 an acre for each of the remaining ten years. If the lease is renewed, the rent for each of the second twenty years is at the rate of \$5 per acre per year, and, in addition, the lessee must agree to pay any royalty on the oysters produced, which the Province may levy. Areas leased cannot be sub-let or otherwise disposed of except on the written consent of the Attorney General of the Province, and the lease is subject to cancellation unless the beds are properly cultivated and maintained.

Available Oyster Area Until the survey is finished the area available for oyster farming will not be definitely known. There are, however, certain portions of the foreshore of the Province that have produced oysters in varying quantities ever since the Island was settled, and it is a fair assumption that barren areas in these districts can be cultivated successfully. The greater portion of the oysters

produced now come from the north, or Gulf shore of the Island, the principal indentation of which is Richmond bay. Other than this last-named bay, the chief oyster-producing areas are found at East river, East Bideford, Mill river and Hill river. At East Bideford good quality cup oysters are produced. A superior grade of oyster is grown here on the private areas of Sharp Bros., the oldest cultivated beds in the Province. The natural beds produce considerable quantities but the uncultivated oyster is always smaller and of poorer shape than that grown on cultivated bottoms. At Hill river and Mill river a long thin oyster is found, much inferior as regards both size and flavour to those of East Bideford and Richmond bay. To the east of Richmond bay, in East river, large quantities of oysters are fished from the natural beds. The East River oyster is well shaped but the fishermen say it is saturated with salt water when caught and does not taste as well as the Curtain Island oyster. It is said to keep better than the Curtain Island variety, however, and improves in flavour as it remains longer out of the water. At Enmore river, on Northumberland strait, a small round oyster of good quality is found, though in very small quantities. The bottoms here and in Percival bay are conceded locally to be good prospective oyster-farming areas. Limited quantities of oysters of very fair quality are also taken from Percival bay, Orwell bay, Vernon river, and other portions of Hillsborough bay. No oysters are taken from the waters of Kings county, although the existence of deep beds of old oyster shells shows how plentiful they once were there, and suggests the possibility of successful cultural operations.

PRESENT OYSTER-CULTURE OPERATIONS IN PRINCE EDWARD ISLAND

Despite the unsatisfactory titles obtainable for oyster areas prior to 1912, there are a few oyster farmers who have managed to cultivate beds. The oldest and largest private beds on the Island are those in the Narrows at East Bideford belonging to Sharp Bros. The title to these can not be disputed because the grant was made prior to Confederation and the British North America Act provides that proprietary rights vested in individuals prior to the passing of that act are not affected by its terms.

The area now held by Sharp Bros. was formerly the property of the Pope family and passed eventually into the hands of John Richards, from whom Sharp Bros. purchased it. It is situated at Squirrel creek and comprises an area of from 40 to 50 acres, the exact extent not being easily arrived at on

Sharp Bros.'
Beds

account of the indefiniteness of the boundary descriptions. The area comprises about 5 acres of an old natural bed and, including this, there is now about 8 acres under cultivation. With the exception of the 5 acres of old natural bed, the area has a soft blue mud bottom, thickly overgrown with eel grass. On 3 acres of this mud bottom a solid bottom has been made by sinking rafts made of $\frac{5}{8}$ -in. lumber covered with gravel and old shells. Inferior oysters picked from the public beds are planted on these artificial bottoms. The area of the producing bottoms is being extended in this way at the rate of an acre a year. It has been found that the lumber, when sunk in this blue mud, is protected from the attacks of marine borers and will last indefinitely. The cost of making bottoms of this description and stocking them with seed oysters is about \$1,000 an acre.

Sharp Bros. consider 500 to 700 bushels of seed oysters of such a size as to be ready for market in a year, sufficient to stock an acre. In eighteen months the oyster increases from one-third to one-half in size. They depend mainly, however, on the set of spat to re-stock the beds. This has proved remarkably abundant and the whole area held is covered with a multitude of small oysters that attached themselves to the shells and old oysters this year. Not only this, but the public beds in the vicinity are heavily stocked with spat from these private beds. The fishermen say that they have never seen such a heavy catch before. At one lift of the tongs covering an area of 9 sq. ft. of bottom we lifted 75 oysters of all sizes—that is over 8 to the square foot. This lift was taken from the old bed, not from ones recently planted on the board bottoms. As an instance of the efficacy of the set of spat to stock the areas, Sharp Bros. informed me that it was a very common occurrence to get 100 oysters at a tongful from bottoms where no seed oysters had been planted.

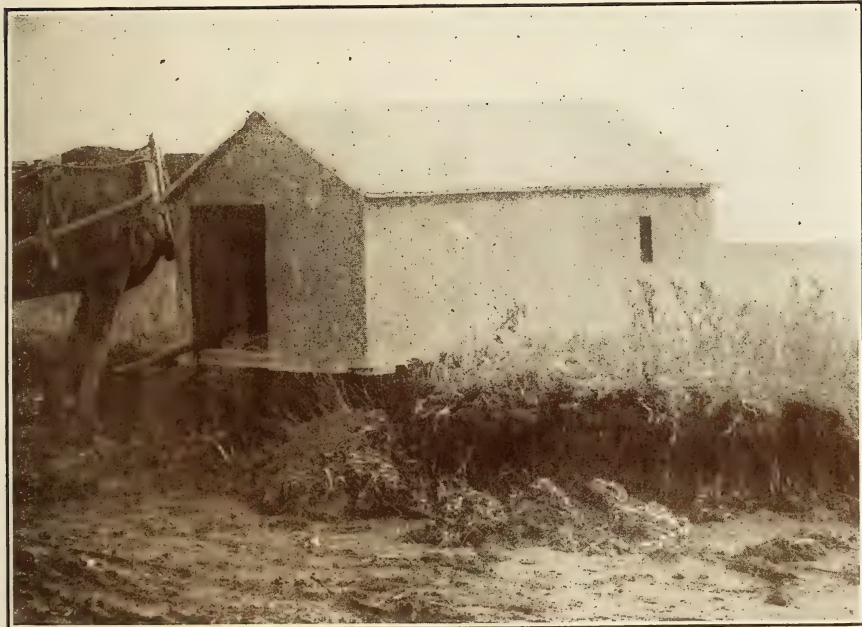
Last year, 100 barrels of American seed oysters were imported. These came from Long island and Oyster bay, but were purchased through New York commission men. The cost was \$5.35 a barrel, delivered.

The harvest from the Sharp beds during the past three years has been as follows:

1909—259 barrels which brought in	\$2,468.25
1910—284 “ “ “ “	2,560.25
1911—336 “ “ “ “	2,933.75
1912—410 “ “ “ “	3,406.50



GUARD BOAT ON SHARP BROS.' OYSTER BEDS AT SQUIRREL CREEK, P.E.I.
An armed man is stationed on this boat, day and night, to keep poachers from stealing oysters from the beds.



GUARDING THE INMAN OYSTER BEDS AT SHEPODY CREEK, P.E.I.
Owners have to protect their own beds from poachers. A guard armed with an Enfield rifle occupies this house at night.

The number of barrels in each of the years above alluded to from 1909 to 1911 includes about 80 barrels taken from the public beds. In 1912, about 150 barrels were taken from the public beds.

Inman Beds The Inman beds, situated on Shemody creek on Richmond bay, differ from the Sharp beds in having quite shallow water over them, the depth in some places at low water being little more than a foot. They cover an area of approximately $5\frac{1}{2}$ acres and are held under lease from the Dominion Government by T. H. E. Inman and James Morrison of Summerside. The authority of the Dominion Government to grant such leases being questioned, the lessees naturally have been troubled a good deal by poachers. Indeed, they had \$80 worth of oysters stolen in a single night a year ago last autumn. Since then a man armed with an Enfield rifle has been stationed in a little house on the shore to guard the property. (See illustration facing page 78.)

The nucleus of the bed is an old natural bed, but planting is being done on contiguous barren bottoms as well as on this natural bed. Small and medium sized oysters, imported from the United States at a cost of about \$4.50 a barrel, delivered, are used for planting purposes. These thrive remarkably well and Mr. Inman is of the opinion that they reproduce here. It must be remembered, however, that the shallow water on these beds is of a much higher temperature than deeper water would be. The shallowness of the water also makes it necessary to harvest in the autumn oysters planted in the spring, in order to avoid the destructive action of the ice. The seed oysters grow fast, however, (increasing about one-third in bulk in six months) and a handsome profit is made by buying in the spring at \$4.50 a barrel and selling the increased yield in the fall at around \$8 a barrel.

Tracadie Bay Mr. Major McKinnon has the remnant of a planted oyster bed on Tracadie bay, which has a soft mud bottom. Mr. McKinnon stated that four years ago he had prepared a bed here and planted 140 barrels of oysters on it. During the winter he was absent from home and, on his return, found two mud-digging machines busily engaged in digging out his oyster bed. They destroyed it all except a fringe around the outside, and even this was badly silted up. Under the law existing then, he could secure no redress. The few remaining oysters, in spite of the difficulties to be overcome, had propagated and developed rapidly.

The method adopted by Mr. McKinnon in preparing a bed on a mud bottom differs considerably from that of Sharp Bros. First, he sinks a raft of poles on which brush to a depth of about 10 inches is

laid. Over this he places about 5 inches of broken stone upon which cultch to a depth of 3 inches is spread. Such a bed is placed considerably above the level of the surrounding bottom and he claims the rise and fall of the tide causes a greater current of water to flow over it, thus affording the oysters additional food. He estimated that 200 barrels of seed oysters planted in the spring in Tracadie bay would grow to 300 barrels by fall. In his opinion a first-class producing oyster bed one acre in area was worth \$5,000.

Mr. H. C. Mills, an oyster dealer in Summerside, said **Locke Shore** that he had imported nearly 100 barrels of American oysters last fall and planted them in Malpeque bay off Locke shore. They had done well in their new environment and the experiment was encouraging in every sense. Outside of these few instances practically no oyster farming has been done in Prince Edward Island. The success that these men have had, however, together with the new conditions whereby a valid lease can be granted, makes it very probable that a flourishing industry will be built up in the course of a few years.

IMPORTANT CONSIDERATIONS IN OYSTER CULTURE

Choice of Location While the area of barren bottoms capable of producing oysters is very large, the fact must not be lost sight of that locations vary widely in their suitability for oyster-culture work. One of the first requisites of a successful oyster bed is a firm, hard bottom. There is a great deal of soft mud bottom around the shores of Prince Edward Island and if oyster planting is to be done on these, the first thing to be done is to construct over the mud a firm hard bottom on which the cultch and the spawners may be laid. Sometimes this artificial bottom is made of board rafts covered with gravel and shells, sometimes of poles, brushwood and rock, the material used depending on its availability and cheapness in the particular locality.

Murray Harbour Bed The importance of selecting a suitable bottom for planting cannot be over-estimated. In many places around Prince Edward Island, especially on muddy bottoms, there is a heavy growth of eel grass which is inimical to the development of oysters. The history of the bed planted at Murray harbour by Captain Kemp brings out this difficulty well. The bed was prepared in 1899 and planted with 84 barrels of small oysters. I inspected the bed from a launch and found that it had been planted on a mud bottom and that

there was an exceedingly heavy growth of eel grass over it. It had been given no attention since 1907 and I was told that many of the oysters had been stolen from it. We made about twenty-five lifts with the tongs and took only one oyster. This was a cup oyster of good quality, about $4\frac{1}{2}$ inches long, which had been partially buried in the mud. Several other specimens were brought up, which at first were thought to be alive, but on closer examination, it was found that there were no oysters between the shells. As the hinges were intact, it is likely that the oysters had grown to this size before being eventually smothered by the mud and eel grass. The character of the bottom in Murray harbour was examined in several places and, in every case, it was found to be black mud covered with eel grass. The condition of this bed illustrates the difficulty that the oyster farmer will have to meet if he plants on a mud bottom that has not been properly prepared and is not carefully looked after.

Salinity and Temperature

In determining the location of a bed, care should also be taken to see that the water at low tide is sufficiently deep to prevent the ice damaging the oysters in the winter and in the spring. Then, again, the salinity of the water covering the beds is a matter of no small importance. If too much fresh water mingles with the salt at that point the oysters will not do so well and their texture will be flabby. If the temperature of the water is low, growth will be slower than in warmer water, although the quality of the meat will be better. The depth of water over the bed largely determines its temperature, the shallower water being warmer than the deeper. Where the water is cold the spatting occurs later in the season, and when oysters from the warmer waters of the United States are planted in our cold waters, they are not likely to spawn until they become acclimatized. The waters of various places also vary widely in their nutritive value. One of the greatest needs of the oyster farming industry in Canada to-day is scientific analysis of the water over prospective oyster areas to determine whether it is sufficiently nutritive to justify the expense of planting operations.

Mud Digging and Oyster Farming

The digging of oyster mud in the winter by the farmers bears an important relation to the work of oyster culture in several ways. In the first place, mud-digging operations carried on too close to an oyster bed are liable to smother the oysters with silt. The Dominion Government, which, as before stated, has legislative jurisdiction over the fishery, has ruled that mud digging must not be carried on nearer than 200 yards to a live oyster bed, and

then, only on the written permit of a fishery inspector. Now that oyster farming is being engaged in, it is imperative that the fisheries officials exercise great care in granting permits for digging mud near cultivated oyster areas.

An additional use will be found for the dead oyster beds when a large area of bottoms comes under cultivation. The oyster farmer must have cultch to which the oyster larvæ may attach themselves in the spawning season and, in many localities, clean, large shells suitable for this purpose, may be obtained from old oyster beds. Sharp Bros., at East Bideford, now secure from these dead beds, a large proportion of the cultch used on their oyster bottoms. As the oyster trade of the Island is entirely a half-shell one, there is no possibility of procuring any of the shells of the oysters now being fished.

Lastly, the mud digger comes into touch with the oyster farmer in that the areas from which he has dug out the oyster mud may possibly be again made to produce oysters. Mud digging is carried on everywhere along the coast, but the two bodies of water where it is most extensively pursued are Bedeque bay and St. Peter bay. From 500 to 600 cars of oyster mud are shipped from Bedeque bay each winter, while the mud-digging operations in St. Peter bay, where a depth of 39 feet in solid oyster beds has been reached, are on an even more extensive scale. The mud-digging machines have dredged out great furrows in the bottom of these bays and the surface left is so uneven that it could not possibly be utilized for planting oysters. Any young oyster placed in the furrows would soon be smothered by the silt drifting down from the higher portions of the bottom.

**Extending
the Oyster
Area**

The Provincial Government, however, is considering a plan to obviate this difficulty. The proposal is to prohibit the public from digging mud on these bays and to install large steam dredges to dredge out the old shells, leaving a level bottom on which oysters may be planted. The farmers would be appeased by being allowed to purchase at cost the shells thus lifted. This plan appears to be quite feasible, although only an actual test could definitely determine its success.

One thing at least is certain, and that is: The immense deposits of oyster shells show that the waters of these bays in years gone by were eminently suitable for the production of oysters. As a matter of fact, the flavour of the Bedeque oysters still lingers in the memories of the older fishermen as being equalled only by those from Richmond bay.

Determining Another vital feature in oyster culture is judging cor-
When the rectly when the settling of the oyster spat takes place.
Spat Settle The spawning season occurs during the latter part of July and the larvæ settle as spat about the middle of August. If the cultch, to which it is intended these larvæ will attach themselves, is put down too long before the fixation of the larvæ occurs, it becomes slimy and the larvæ cannot attach themselves to it. The aim of the oyster farmer is, therefore, to put down his cultch just before the fixation of the larvæ takes place. Professor Stafford of McGill University, in his study of the development of the oyster has perfected a method, by means of microscopic examination, whereby the time of fixation may be definitely determined.* This, however, cannot be applied by the ordinary oyster farmer unless he has received some instruction in it. Until the application of this method can be made general, the time of putting out the cultch must be decided, as heretofore, by rule of thumb. As soon as there are a considerable number of areas under cultivation in Prince Edward Island, it is very desirable that either the Dominion or the Provincial Government should instruct the oyster farmers how to apply Professor Stafford's method.

FISHERIES PROTECTIVE SERVICE

It is imperative that the Dominion fisheries protective service be improved so as to afford adequate protection to cultivated oyster beds. In its present condition it is almost worthless. Sharp Bros. are compelled to keep a patrol boat on their oyster beds to ward off poachers† and the Inman beds at Shemody creek are protected by an armed sentinel on the shore. Now that the people of the Island are entering upon oyster farming on an extensive scale, it is absolutely necessary that the Dominion Government enforce the law.

System The fisheries protective service, as at present organized,
Defective is inefficient and must remain so as long as the present method of appointment prevails. Under the present system, the fishery guardians are local men—farmers or fishermen—who receive their appointment because of their political affiliations and are paid a small sum yearly for seeing that the fisheries regulations are enforced in their districts. The appointee knows he was not appointed because of his peculiar fitness for discharging the duties of his position,

* Prof. Stafford gives a popular exposition of this method in his article on "The Conservation of the Oyster," in *Sea-Fisheries of Eastern Canada*, published by the Commission of Conservation in 1912.

† See illustration facing page 78.

but because he belongs to a particular political party. The inevitable result of this system is to cause him to regard his position as a sinecure and to make his attention to duty a most perfunctory one at best. Moreover, the salary given him tends to strengthen this impression; it is so small that he could by no means devote much attention to his work. Besides, being a local man, he must not be too hard on his neighbours who break the laws now and again. If he were too strict, he and his family would be socially ostracized. The result is a protective service that is looked upon as a joke by the whole community. In every little fishing hamlet there are stories of how the laws are broken and of how the guardians wink at law-breaking, keeping studiously out of the way when they know it is going on. Not only can such an inefficient organization do but little to protect the fisheries, but it tends to debauch the morals of the whole country where it exists. No one who has not mingled among these people can imagine how it demoralizes the finer sensibilities of a law-abiding citizenship and engenders a disrespect for all law.

**Suggestions
for Improve-
ment**

It is not so much the officials as the system that is at fault. I am of the opinion that the best results would be achieved by appointing officials at salaries which would permit them to give their whole time to their duties. If the guardians were paid adequate salaries and compelled to give their whole attention to the work, fewer officials would be required to do the same amount of work. All the appointments should be made on the ground of capability, not politics. Under no consideration should guardians for a district be appointed who are residents of that district. If an official is to discharge his duties properly in any district, he must come to it as a stranger. Furthermore, the officials should be moved to new districts every three or four years, and the inspectors placed over them should have absolute power to suspend and to dismiss them for inefficiency or neglect of duty. In no other way can discipline be built up. It must be remembered that the people in these fishing districts have been used to seeing the law scoffed at and trodden under foot for years and that the new organization will have to work against a strong public feeling of suspicion. Talk about reorganization of the fisheries protective service to these people and they will shake their heads in a knowing way and say, "Yes we have seen reorganizations before and they all amounted to the same thing." To overcome this feeling on the part of the people the service must be placed under a rigid system of inspection and strong-handed discipline.



OYSTER COVE, INDIAN RIVER, P.E.I.

This inlet is an arm of Richmond bay and is good potential oyster ground. A small natural oyster bed exists off this shore.



THE *Ostrea* AT MALPEQUE, P.E.I.

This little boat is overworked. She has to keep the public oyster beds in condition, look after the Dominion Government's experimental oyster culture work and keep poachers off the oyster beds of Canada's whole Atlantic seaboard.

REVISION OF PRESENT REGULATIONS

Close Season and Marketing Once the protective service has been reorganized the next essential is a thorough revision of the existing regulations respecting oyster fishing. The present regulations were intended to apply to free-fishing conditions and not to conditions where oyster culture prevails. The regulation fixing a close season, although quite proper when it was formulated, has, with the advent of oyster farming, become most unjust and unfair. The effect of it is to prevent the oyster farmer from marketing his crop except in the open oyster-fishing season which extends from October 1 to March 31. The result is that, on account of winter conditions, oysters can be fished and marketed practically only during two months of the year. As a consequence, large quantities are thrown on the market during these two months and prices are demoralized. When a man plants and cares for an oyster bed there is no good reason why he should not be allowed to sell his oysters at any time they can be profitably marketed. Self-interest will force him to see that he does not work injury to his bed. It can readily be seen how the progress of oyster farming will be retarded unless provision is made whereby oyster culturists may market their products at any time they choose to do so.

Packing and Grading The fixing of a standard-sized oyster barrel and the establishment of a system of government inspection and branding of the packages are two other matters which require the immediate attention of the Department. I have interviewed the largest oyster dealers in Montreal on this subject and they are unanimous in their opinion that the Prince Edward Island oysters, although naturally superior in quality, cannot hold their own against the United States oyster unless they are properly graded and put up in packages of fixed size. Oyster consumers, they declare, demand the highest class article they can procure, regardless of cost. This, however, is a fact that the oyster fisherman cannot fully appreciate, and consequently, he is ruining his own prospects by shipping small and inferior oysters in packages of all sizes. When a retailer buys a barrel of oysters he must know approximately how many oysters there are in it, else he cannot determine the proper price at which to sell them. If the barrel is not of standard size and the oysters are not graded, he sells them at either too high or too low a price. Thus, either the customer or the dealer is cheated, and either contingency is disastrous to the Prince Edward Island oyster.

Inspection and Branding It is to be expected that, with the inauguration of oyster culture, an attempt will be made to market large quantities of transplanted United States oysters as genuine Malpeques. Although such oysters, after being in Prince Edward Island waters a certain length of time, do absorb the flavour of the native product, yet the knowledge that they are being sold cannot help but interfere with the market for the well-known Malpeques. It is necessary that these United States seed oysters be imported for a few years till the beds can be adequately stocked, but, when being marketed, they should be carefully distinguished from the Prince Edward Island oyster. This distinction cannot be made unless a Government system of inspection and branding is established.

Summary In summarizing, it may be said that the prospects for the establishment of a profitable oyster-farming industry in Prince Edward Island are encouraging. Now that the oyster farmer can procure good titles to bottoms, the responsibility rests on the Dominion Government and the Provincial governments to see that the conditions under which he works be made as favourable as possible. What is most urgently needed is a change in the present oyster-fishing regulations which were not intended to apply to oyster-culture conditions. This will, no doubt, be speedily effected; no good reason can be advanced why it should not be. The need for the reform of the fisheries protective service is particularly urgent. As constituted at present, it is ineffective in protecting the fishery and is debasing the moral tone of the fishing communities as well. That a reorganization is urgently required is admitted by all; the danger lies in continued delay. As little is known scientifically about the propagation of oysters in Canadian waters, it would be a great boon to the oyster farmers if the governments concerned would have scientific researches made by a man of scientific attainments, who could also appreciate the practical and economic aspects of the industry. No argument can be advanced why a standard-sized barrel should not be adopted by law and a system of government branding established. The markets require it and an extended investigation is not necessary to determine the details. Just at present people in Prince Edward Island are very enthusiastic over the business of oyster farming. It is, however, an industry in which success can not be won without the possession of accurate knowledge and the adoption of sound business principles, and it therefore behooves the government authorities to do all in their power to prevent this initial enthusiasm of the oyster farmer from being dulled.

Wednesday Morning Session

The Commission resumed at half past ten o'clock Wednesday morning, Hon. W. C. Edwards in the chair.

THE CHAIRMAN: I will now call on Professor Prince, Dominion Commissioner of Fisheries, for an address on the Biological Board of Canada.

The Biological Board of Canada

BY

DR. E. E. PRINCE

Chairman of the Biological Board of Canada

MY subject is the work of the Biological Stations of Canada, and, as a preliminary to what I have to say about the Biological Stations and their work, I might say a word or two about fishery matters generally, and the Federal administration of these fisheries; because it has often been remarked to the credit of Canada that there was created at Confederation for the management of the fisheries, the Department of Marine and Fisheries, with a cabinet minister at its head.

U. S. Fish-
eries Admin-
istration

This is a remarkable fact, not generally appreciated, until we remember that almost no other country in the world has an organization like the Marine and Fisheries Department of Canada. The United States, for instance, is often supposed to have a great fisheries department but it has no administrative powers at all over fisheries of the various states, the property in and jurisdiction over the fishery resources being vested in the respective states. It is well known that they are very jealous of interference by the Federal Government. The Federal authorities in Washington are most careful in dealing with any matters that bear upon the right of a state respecting the administration and actual management of the fisheries.* The Fisheries Bureau at Washington is largely a scientific board—what I would call a biological board, little more than that. It carries on researches and pisciculture, but it does not correspond to the Canadian Department of Fisheries, except in a very limited way, and, as a branch of the Department of Commerce and Labor, it comes under another department.

* In its advisory capacity the United States Fisheries Bureau may influence fishing legislation. In Alaska it has executive powers now and enforces laws affecting the salmon fisheries.

France and
England

In France, the fisheries are administered by the Ministère de la Marine, while in England, agriculture and fisheries are included in the same department, but, for many years, the fisheries in England were managed as a very subordinate branch of the Board of Trade. I might mention other cases, but, as a matter of fact, I simply emphasize the statement that Canada is unique in having a department directly devoted to the administration of the fisheries.

Dual
Licensing
Power

It is fortunate for the Dominion that its fishery resources, in many respects unparalleled in the world, should have a special department with powers of protection and conservation, and even of licensing, which, so far as I am aware, no other federal fisheries department possesses, unless it be that of Japan. I say even the power of licensing, for although the decision of the Imperial Privy Council in 1898 declared the property in the fisheries to be vested in the provinces (excepting the Western provinces and the Northwest territories), it decided also that the Dominion Government has the power to impose, by way of license, a tax for exercising the right to fish; so that, although the provinces have the property in the fish and the right to issue licenses and to obtain revenue thereby, the Dominion has also the supreme right of doing the same thing, although it has not exercised that right.

Dominion vs.
Provincial
Jurisdiction

THE CHAIRMAN: Is there any conflict?

PROFESSOR PRINCE: There has been really no conflict; the only trouble has been that the exact limits of the open sea-shore fisheries has been left undefined. The Dominion has exclusive authority in public harbours, but the Quebec Government wishes to exercise full authority on the open sea-shore in the gulf of St. Lawrence. The Dominion claims, especially where it comes in contact with foreign fishermen, that it has the right to exercise full authority and surveillance, and the matter is still unsettled.

How much the growing fish industry of Canada and its flourishing condition is directly due to the exertion of the Fisheries Department and its staff, it is impossible to say. The Department has not done all that could be wished but it has exercised control and supervision for the last forty-five years, which must have done incalculable good, and I do not hesitate to say that it accounts for the much more fortunate condition of many of our sea and interior fisheries as compared with those of the United States. I might mention the condition of the lobster, the salmon, the smelt, the clam, the salmon trout, the lake whitefish, the pickerel, and other fisheries, as compared with the condition of the corresponding

fisheries in the United States, many of which are really on the verge of exhaustion in the waters to the south of us. I do make an exception to the case of the oyster fisheries of certain states which have most effectually handled their oyster resources. I hope we may follow their example, and, in fact, we are taking steps to do so.

For over a quarter of a century the Department of Scientific Supervision Marine and Fisheries carried on its work without any trained scientific aid, so far as fisheries were concerned. Light-houses and break-waters were built, and engineering work generally was done, with the aid of trained and able men, but the fishery work was in the hands solely of ordinary officials who were destitute of any technical or expert knowledge of fish and fishing industries. At times, it is true, men of training were asked to assist in special fishery researches. Prof. Hind, of King's College, Nova Scotia, was asked to do some work of that kind in the gulf of St. Lawrence, in connection with the Fishery Commission, Halifax, 1877,* and also in the West;† and in 1871, 1872 and 1873, the late Dr. J. F. Whiteaves, a most brilliant zoologist, carried on researches into marine life in the gulf of St. Lawrence, researches which he began privately in 1867 and 1868, and to-day his reports are of very great value.‡

But it was not until 1892, a quarter of a century after the department was created, that Sir Hibbert Tupper, decided to have a fisheries officer in the Department, who had been trained in the scientific and technical aspects of fisheries, and it fell to my lot to be asked to take this position which was entitled "Commissioner of Fisheries." I do not know that it is necessary to occupy your time by saying what the results of that appointment were, but, as a matter of fact, I soon found that I was so burdened with ordinary routine work of the Department, that my scientific training, though of daily utility, could not find its full scope, and I was for many years handicapped by ordinary routine duties, which occupied most of my time.

I had not been long in the Department before I reported on the necessity of scientific stations to investigate fishery problems, and in 1893 I presented to the Minister a report in which I recommended such stations, pointing out that it was not

* See Prof. Hind's two important reports, parts I and II (Proceedings under the treaty of Washington, May 8th, 1871) printed by Charles Annand, Halifax, N.S.

† The lakes, rivers, fish, etc. of Manitoba and the West are reported on in Prof. Hind's reports of progress (N.W. Exploring Expedition, Toronto, 1859).

‡ Marine and Fisheries (Fisheries) Reports, 1871 (app. K.), 1873, 1874 (app. V).

possible to deal properly with fishery problems, and elucidate these questions without scientific men to collect expert information.* I stated that there are few civilized countries that have not established such scientific institutions, and emphasized the policy of Germany, which, on a limited coast-line, has several marine laboratories. Indeed, in 1890 no sooner did she come into possession of Heligoland than she immediately founded a marine station there, equipped with all appliances for aiding the fisheries of the Fatherland.

**British
Trawling
Controversy** I had realized the importance of these scientific stations from the fact that I had worked for many years in Scotland under the most distinguished marine expert of the day, Prof. Carmichael McIntosh, of St. Andrews, and there began an entirely new field of work—the investigation of the breeding habits of fish in the sea. There had been a trawling commission in 1884 investigating the relations between the beam-trawl and the ordinary methods of fishing by lines and nets, and the fishermen of Scotland were a unit in opposing steam trawling. That Commission investigated the trawling question, and must have heard the opinion of representatives of 40,000 or 50,000 fishermen, and, without exception, the statement was made that, inasmuch as the fishes spawned on the bottom of the sea, the trawl, dragging along the bottom, destroyed incalculable quantities of spawn. I was asked to commence the investigation of sea fish and find out about the alleged destruction of spawning beds on the bottom of the sea. I had authority to carry on researches during my academic holidays, which were seven months, and, at the end of that time, I was to report on the whole matter. When I tell you that the seven months really became seven years, you will see how the problem grew; for I found that no fisherman knew anything about the spawning of any fish, except the herring. The fishermen's view was entirely wrong inasmuch as the whiting and ling, and cod, and mackerel and sole, and practically every fish of commercial value, did not spawn on the bottom of the sea. The last instrument to capture fish spawn, was a beam-trawl. In other words, the results showed that we had been entirely in the dark in regard to the spawning of sea-fishes. The result was a report published in 1890 as a very technical memoir (and presented before the Royal Society of Edinburgh) in conjunction with Prof. McIntosh, entitled "The Life History of Marine Food-Fishes." It was really the first comprehensive account of the spawning of marine fishes in Britain and led the way to later work by British biologists since that time.

* Marine and Fisheries (Fisheries) Report, 1893, pp. clxxxviii-cxcv, on Marine Scientific Station for Canada.

I point that out simply to show you how important I felt it to be that Canada should have biological stations, and, inasmuch as our fisheries, as a whole, may be divided broadly into three great divisions, mainly, the Atlantic, the Interior and the Pacific fisheries, the Dominion Government has founded three marine stations, the Atlantic station, at St. Andrews, N.B., near the mouth of the St. Croix river, the Great lakes station at Go-Home bay, Georgian bay, and a splendid station, including residence and laboratories at Departure bay, near Nanaimo, B.C.

Departure Bay Station When Dr. Starr Jordan, the famous United States fishery authority, visited the station at Departure bay, he said that it was one of the most remarkable sites for a biological station that could be found. At the conclusion of the Winnipeg meeting of the British Association for the Advancement of Science, four years ago, a large party of the most eminent scientific men from Great Britain were taken across to the Pacific coast. The biologists visited the Biological Station at Departure bay, and, for two days, revelled in the living treasures, the fishes, crustaceans, shell-fish, etc., taken in the wonderfully prolific waters there. The unanimous opinion was expressed that, in some respects, it was almost equal to the famous Naples station in regard to its facilities for fruitful fishery and biological work.

Operation of Biological Stations I ought to say a few words about the methods by which the stations are conducted. For many years there was a small vote of four or five thousand dollars from the Dominion Government and, with this, we had to carry on the whole work of the station. Consequently, we could pay no salaries except that of attendants about the place and also to give an honorarium to a curator or junior scientific worker for the summer months, as a rule some qualified student from a university. The investigations were carried on by a staff of university professors and senior workers who received no salary. We paid railway fares and, in some cases, paid a part of the expenses for board, but, as a matter of fact, the research work was done without charge to the Government. At that time the station at St. Andrews was on a large floating scow and it was moved about to Canso, N.S.; Malpeque, P.E.I.; Gaspé, Que., and finally reached the mouth of the St. Lawrence near Seven Islands. At each of these points the staff did exceedingly good work, the idea being that by moving about from point to point, we could get a general survey of the fishes and marine life of the various localities along the coast. It was pioneer

work. Thanks to the generosity of the Dominion Government in founding other stations at Georgian bay on the Great lakes and Departure bay, British Columbia, the vote was increased so that at the present moment the appropriation is actually \$15,000 for the Marine Stations and \$2,500 per annum for the lake stations. So we have a total annual amount of \$17,500, and with that money have been able to recompense some of these workers. But, even now, the remuneration we can give to a senior worker, a science graduate of a university, is very small, and the professors on the staff receive no salary whatever.

Biological Board

The workers have been mainly those who form the Biological Board, which manages these stations. The Board has consisted for many years of two representatives from Toronto University, Prof. MacCallum and Prof. Ramsay Wright; Prof. Willey, of McGill University, and Prof. McBride and the late Prof. Penhallow; Prof. Bailey, of the University of New Brunswick; Rev. Abbé Huard of Laval University; Prof. A. P. Knight, of Queen's University, Kingston; Dr. A. H. McKay of Dalhousie University, Halifax; and Prof. Buller of the University of Manitoba. But the Board was practically honorary and had little official authority apart from managing the scientific researches; the actual control of the station was vested in departmental officials. As a matter of fact the Board found that the work of the station was hampered all the time by the rules and regulations of the Department. We could hardly buy a broom without first certifying that we really needed it and sending an assurance to Ottawa that it was quite necessary. Hon. J. D. Hazen, the present Minister of Marine and Fisheries, took a very much larger view of the matter, and, last year, practically re-created the Biological Board, made it by statute an independent organization with the complete management of the biological stations and full control of the funds voted for biological work. This year the Board starts a new era; it has full control of the work and of the spending of its appropriation. It is in a very different position from what it was and we hope to be able to encourage workers much more than we have in the past.

Reports Published

When I point out the fact that we have issued several biological publications, embracing thirty-nine separate papers or reports, called "Contributions to Canadian Biology," it will be seen that we have accomplished something. The first was published in 1901, the second in 1907, and, there is one which is being issued now, a much larger volume than the other, containing the papers from 1907 to 1912, quite an elaborate volume.

**Need of
Trained
Workers** The three stations have done a large amount of work considering the difficulties encountered and considering the fact that the number of trained and qualified investigators in this country is limited. Men specially trained for biological work are not numerous in Canada. It is impossible for an ordinary university student to sit down in a biological laboratory and do effective original work. He has to be trained on special lines. We have felt that the body of men from which we could draw in Canada for special biological work has been limited, and have considered the necessity of securing some distinguished worker from Europe, say an expert Norwegian scientist, to undertake for some years an elaborate fishery investigation on the Atlantic or Pacific coast. It would be an object lesson in the kind of work that is required to be done. The fact that we have nearly 8,000,000 people as compared with 90,000,000 in the United States, 65,000,000 in Germany, 40,000,000 in France, and 45,000,000 in Great Britain, makes it plain that we cannot expect to have available so many qualified and trained men for this special work as are to be found in these countries. It has to be borne in mind that, hitherto, there has been no very promising career open to the man who simply devoted himself to fisheries investigation, but the universities are now devoting more attention to training students in these particular lines of technical work.

**Short
Season for
Work** One great difficulty in regard to scientific stations has been that the season in which work can be carried on, is comparatively short, due partly to the severe weather conditions on the sea-coast, rendering it almost impossible during many months of the year to work in the midst of ice and other unfavourable conditions.

Another difficulty is that the men who are qualified to carry on biological work have been usually engaged in academic duties and had only a certain portion of the year free. It is intended to have qualified men to carry on continuous work throughout the year. It has been my plan to lay, every year, before the Board a number of problems for investigation.

**Fishery
Problems
Investigated** Many of these problems have been attacked and, in some instances, valuable results obtained. We have had very many practical investigations. The first series of reports, the results of an investigation by Prof. A. P. Knight, of Queen's University, contained an account of the effect of water pollution on fish life, a most important subject in Canada. His reports on saw-dust

pollution, etc., are of great value and the results he obtained proved not in accordance with many popular ideas in regard to these matters. The shell-fish industries are important and the first report of the Board included an account of the clam fisheries. Dr. Stafford of McGill University, was asked to take up the work. It was new to him but he did extremely good work, and he was requested to follow up the work on Prince Edward Island in regard to oysters and other shell-fish. Prominence has been given to practical questions bearing directly on crucial matters connected with the fisheries.

**Observations
on Sea
Water**

We soon found that it was necessary to have some physical observations on the sea water, and Prof. MacCallum began some researches which led him into a large biological field of a technical scientific character. His researches into the chemistry of *medusæ* or jelly fishes followed as a consequence from his analyses of sea water and from taking densities, temperatures, etc. Dr. Copeland of Toronto has continued this work and has published an account of his physical researches into sea water, which is the beginning of more extensive work.

Dr. W. Bell Dawson, who has charge of the Tidal Survey under the Naval Service of Canada, has also assisted the Board. We have been indebted to him for instruments and a great many data in regard to physical observations and he has many times expressed the desire to co-operate with us if a plan of work can be devised. I have also had communication with Prof. H. T. Barnes, of McGill University, who thinks that the Biological Stations would be able to assist him, and *vice versa*, in connection with his work in regard to the movement of ice in the gulf of St. Lawrence.

**Oceanic
Investigation** The most important suggestion, however, has come from Europe, as the result of a conversation with Sir John Murray, in Winnipeg a few years ago, and later in Scotland. Sir John urged that there should be a very large and elaborate scheme of research in regard to the physical features of our Canadian waters, marine and inland, and he was prepared, I think, to aid such a work himself, by bringing out his own vessel and assisting in other ways.

The Biological Board's last communication in connection with such researches refers to the International Council for the Investigation of the deep sea. The Council is anxious to have some Canadian representatives on it, to co-operate along with the Biological Stations and to aid in any work carried on by the Government of Canada in investigat-

ing the fishing grounds of the deep sea. Most of you may know something of the elaborate work carried on by that international body in the North sea. The only difficulty has been that it will involve very large expense, and, whether that expense is commensurate with the benefit to Canada, is a question which will require to be carefully considered. Biological expenditures in Canada should, we feel, first of all benefit Canada, whatever it may do for other nations.

Faunistic
Researches I may add that, apart from the practical researches to which I have referred, faunistic work has been carried on, or investigations into the varieties of fishes, crustaceans shell-fish, etc., that inhabit our seas. Dr. Stafford was instructed to carry out such work on the Atlantic coast. A report of surpassing interest and value is one by the late Rev. G. W. Taylor, who was scientific curator at Departure bay, on the Pacific Coast vertebrate and invertebrate fauna. He published in 1908 a list of edible British Columbia *mollusca*, which names between thirty and forty species of shell-fish exceedingly good for food. As a matter of fact, there are only about three kinds eaten on the Pacific coast. He also investigated the shrimps and other edible crustaceans on the coast of British Columbia, and he later completed a list of one hundred and thirty edible crustaceans, covering nearly thirty pages in the last (Part III) Biological Report.

Oyster
Fisheries The oyster fishery has occupied some attention. Prof. McBride, for two or three summers, tried to carry on new methods of artificial culture on a small scale; Dr. Stafford has investigated the embryology of the oyster and other shell-fish and has extended our information in this way. He has established some points of great importance in regard to the oyster. The Commission of Conservation have had an account of his investigations at a previous meeting of its Committee on Fisheries, Game and Fur-bearing Animals.*

Prof. Bailey of Fredericton, was sent to investigate the distribution of diatoms over a wide area, ascertaining from his results the possibilities of oyster culture based on the amount of food in the water. In fish culture, there is a danger of over-stocking an area of water if you do not take into account the fact that water may have a limited amount of food in it, and planted shell-fish or other fish may starve. It was important to know the distribution of food of oysters on certain

* See *Sea-Fisheries of Eastern Canada*, published by the Commission of Conservation in 1912.

coasts, and Dr. Bailey has traversed the shore from the bay of Chaleur to the St. Croix river investigating the living diatoms on which oysters live and fatten so rapidly.

Bait Problems One very important research of Prof. Knight has been in connection with bait. He has been trying various kinds of bait, and this is very valuable to the Dominion government because considerable expenditure has been made upon local bait freezers. Fishermen claimed that frozen bait was very much inferior to fresh bait, and different kinds of bait were tried by Prof. Knight, with interesting practical results.

There were also some illegal methods of fishing practised on both the Atlantic and the Pacific coasts. For instance, the use of explosives was forbidden on the ground that, while they may be effective in killing certain kinds of fish—especially pollock in bay of Fundy waters—this method is destructive to other kinds of marine life, such as young lobsters. Prof. Knight was requested to investigate the extent of the damage done in this way. His researches are given in a report on the use of dynamite and other explosives in their effect on fish life.

Colour of Salmon Flesh Amongst the problems taken up were such questions as the colour of the flesh of salmon. The question claimed some of my time many years ago and I never could carry out as elaborate a research into that matter as I desired. But when I say that the value of canned salmon rests more on the colour of the meat of the fish than upon its flavour, you see how important it is to know to what the colour is due. The best flavoured salmon on the Pacific coast is least in demand on the market because the colour is pale. The inferior salmon, of a rich red colour, brings the best price, and takes the lead because of its colour, this having no relation to excellence of flavour or edible superiority. The rivers of British Columbia abound in sockeye salmon (*Oncorhynchus nerka*) with the deepest coloured flesh of any Pacific salmon, and consequently the British Columbia salmon secured the highest price in the markets of the world.

Diseases of Fish We conducted some elaborate researches, which are still in progress, on diseases of fish. We have also had experiments with lobster traps and the alleged taking of small lobsters in traps with wide lath spaces. We have also had experiments on the viability of various kinds of fish, that is, the power of living under various circumstances. In shipping fish, this is important. In sending live fish to stock new waters, say from the Atlantic to the Pacific,

it would be desirable to know which species of fish would best survive the journey. We have had some experiments on that and on different methods of carrying young fish by mechanically oxygenating the water in which the fish are carried. We succeeded in transporting some black bass successfully from Ontario to Alberta.

Preserving Fish Some observations were also made at the station at Gaspé on methods of preserving fish, by Mr. Sahlstrom, a Norwegian expert who had a new method of preserving fish. The experiment was successful so far as the preservation of the edible qualities of the fish was concerned, but, as the colour and appearance deteriorated, it followed that the method could not be adopted as practicable.

Training of Fishery Workers So far we have had only trained workers in the biological stations; as the senior men had no time to teach beginners, we could not appoint learners on the staff. The Board has considered whether it should not provide some course of biological and technical instruction, and that may be done in the future. One line of instruction will be taken up immediately, viz., the training of men to take charge of hatchery work.

Lack of Trained Men Few are probably aware that, while Canada has done splendid work in regard to fish culture, there has never been a single technically trained man, except myself, in the fish-culture service of Canada. Happily, good practical men have not been wanting. The founder of our fish-culture system, Mr. Samuel Wilmot, an Ontario farmer, was a remarkable man, who began to hatch fish forty years ago. He was given charge of fish culture in 1868, and he was very assiduous and successful in his work. He overcame many difficulties absolutely from sheer pluck and hard work, but, when I came to Canada, I found many technical processes only correctly understood by a trained man, were not being done right. When I took charge of the fish hatcheries of the Dominion, I introduced some new methods of handling fish which I think were attended with benefit. At that time the hatcheries were in charge of men who, before they took up these duties, were very little acquainted with fish-culture work; even in the United States this was so. There is no proper school of training in fish culture. At the International Fisheries Congress in Washington in 1908, I read a paper on this subject, and it struck the Congress as extremely important that such fish-culture operations should be in the charge of trained men who knew what a living egg was biologically and something about the nature and habits of young and adult fish. I am

glad to say that the Biological Board will take up the training of men for fish-culture work.

Apart from Canadian scientific workers, we have had some valuable men from the United States and from the other side of the Atlantic. I received the other day, three important papers, announcing very important zoological discoveries by two English biologists at our Canadian stations. One is the discovery of an entirely new parasite on crustaceans which, on the other side of the Atlantic, scientists will regard as of unusual interest and importance. This discovery of *mycetomorpha* was made by a Cambridge worker, who carried on his researches at the Departure Bay station.

In closing, I may add that I shall be glad to answer any questions regarding the biological stations.

DISCUSSION

DR. JONES: I should like to express the appreciation of the Commission for the excellent address with which Prof. Prince has favoured us. He suggested that he is quite willing to answer any questions, and I wish to ask him some.

Steam-
Trawlers Last year representations were made to the Committee on Fisheries, Game and Fur-bearing Animals by some fishermen in Nova Scotia respecting the employment of steam-trawlers on this side of the Atlantic. The objections to the employment of steam-trawlers that Prof. Prince spoke of, were repeated by these men. I sent to Great Britain and received copies of the reports of the Commissions which dealt with the matter of steam-trawling there, and it is quite clear, as Prof. Prince remarked, that in connection with most food fishes, there is no destruction of the ova of the fish.

On another point the evidence is not quite so clear, and that is, whether or not the steam-trawler affects injuriously the feeding ground of the fish. Perhaps the Professor can tell us something about that. It appeared to me that there was some evidence which would lead one to suppose that serious injury was done to the bottom in certain sections causing the destruction of the material on which fishes feed; and in that respect the operation of the steam-trawler was quite injurious.

The destruction of immature fish by trawlers was, to my mind, clearly proved. It was shown that there was a very large destruction of small fish, not commercially valuable, which were taken up by the trawl. These were thrown overboard and wasted, whereas, if they were allowed to grow, they would become commercially valuable.

**Availability
of Biological
Reports**

I am not familiar with the reports of the Biological Board. I should like to receive them and shall take advantage of the suggestions of the Professor to hand in my name to receive copies of them. I am not sure that the public generally know that these reports are available, and I should like to know in detail if any systematic plan is followed in issuing them, or whether they are simply issued from time to time. It seems to me that some of the most valuable discoveries that have been made in these researches are neglected. I should like to know if there is an effort made to publish all conclusions which are of public interest, in a systematic way, from time to time. It seems to me that the work of the biological stations can only be made of value by issuing reports in which the results of investigations are presented to the public who are more or less interested in these questions.

**Are In-
vestigations
Practical?**

With respect to the work of the Biological Board, I should like to know whether there is any effort made to investigate questions, not so much from a strictly scientific point of view, as from the point of view of practical fish culture. I have in mind particularly the matter of oyster culture. Have investigations been carried on, and, if so, have the results been published in such a way as to be of interest, not so much to scientific people as to practical men inclined to undertake the culture of oysters?

**Economic
Investigations
Necessary**

It seems to me that the Biological Board could very well make use of fisheries experts who are not so much interested in the biological point of view as in investigating problems which would be of interest in fish culture and the stocking, curing, and transportation of fish, and questions of a more or less economic nature. I am aware that such questions as these are not exactly biological questions, but they are important, and the two interests might be in some way combined, so that the fisheries experts might make use of the present biological stations to carry on investigations, not only of a scientific but also of an economic interest in connection with our fisheries.

We have been told this morning that the Board was carrying on some investigations into the food content of sea-water, particularly with regard to the food of oysters. At what stage has that investigation arrived, and is it known what the food of different kinds of fish is, and under what conditions the fry will develop best? These are simply a few matters that occurred to me as the address was being given, and, as these matters are of practical interest, the Professor may be able to help us in reaching some conclusions in regard to them.

Colour of Salmon MR. SNOWBALL: I understand from Prof. Prince that the colour of the flesh of a fish does not affect its edible qualities. Do I understand that the salmon of red or pink colour is not preferable to one of white as far as the taste is concerned? Whether it is the colour that attracts our eyes I do not know, but I certainly prefer the red-fleshed fish. We, on the Miramichi, consider that we have a very fine fish river, and, of course, while I am interested in another line of business, I feel that the preservation of the fish is one of the great functions of the Commission of Conservation.

I asked yesterday if the kind of salmon fry taken for hatchery purposes, the fall salmon, was the correct fish to take. We, on the Miramichi, have discussed it, and have come to the conclusion that the salmon taken there and put into the hatcheries, are not of the quality to produce the kind of fish we think should be in the rivers and bays for the future.

With regard to the lobster fishery, one of the important industries on the Miramichi, I may say that any one who has lived on the sea as much as I have, has seen how unfavourably the lobsters taken to-day compare in size with those taken fifteen or twenty years ago. It has seemed to us that, unless some definite action is taken to restrict the size of those caught, we will soon lose one of the most important industries of Eastern Canada. I have been wondering how far the officers of the Department of Marine and Fisheries have been entering into a study of these matters.

I was glad to hear what Prof. Prince had to say, because the establishment of the Department of Marine and Fisheries, was due to the Hon. Peter Mitchell, who came from the county from which I come. The Professor also referred to the broadening of the powers of the Biological Board that had been effected by the Hon. Mr. Hazen, who comes from our Province. I think, therefore, that the advance that has been made in this department is to be credited largely to the Province of New Brunswick.

MR. DAVISON: We in Nova Scotia are like the people on the Miramichi: we like the salmon with the rich colour. Atlantic fishermen are greatly opposed to the steam-trawler. The Biological Board should have some better methods of presenting their findings to the people; their experiments should be made to educate the general public who so often entertain wrong ideas regarding fishery matters. It is a shame that the officers of the Board heretofore have been so handicapped by not having complete control of the operations entrusted to their charge. In the matter of publishing the results of their findings, I think that the

Biological Board should do as the Commission of Conservation does in having its reports presented to the general public in artistic and readable form.

PROF. PRINCE: I shall deal first with the observations of
Reports are Dr. Jones in reference to the publication of reports.
Technical

Many of these reports are very technical and it is a rather difficult matter to know what can be done with a technical report in the way of making it available to the public. In one or two cases I have undertaken to publish these reports in popular form, but found that the worker himself could not divest himself of technical language, and it is not of much use to place a technical biological report in the hands of a fisherman.

As to the slowness with which our reports appear, I may say that it takes time to secure results and some investigators have not yet been able to complete their work. To do the best work, you must give men time. I illustrated that point when I told you that I started out to do in seven months what it took me seven years to accomplish.

Steam- Steam-trawling is of course, full of perplexities and
Trawling difficulties. In any argument against steam-trawling, we ought to be sure of our ground. The fishermen are not always sure of theirs: it was mistaken ground they took when they said the trawling destroyed the spawn. The beam-trawl has been largely replaced by the otter-trawl, which does not travel solely on the bottom. All trawling has to be done on smooth bottom and there is a large amount of bottom in every sea on which no trawler could work without running great risk of losing its gear. I have been on some steam-trawlers when at work and know that on two successive days we lost a valuable trawl each day. There is a lot of rock bottom not suitable for trawling. That bottom is, so to speak, a reserve, and on it there is very often abundant life upon which fish may feed without interference from the trawler. It has been claimed that the old steam-trawler acted like a plough and thus improved the ground. Whether it cleans up the food of fish from the sea-bottom or what the actual effect is I cannot say. Yet it is practically impossible to exterminate sea fish on account of the abundance of their eggs. Our cod banks have been fished for five hundred years by immense fleets and the supply is still very large. Commander Wakeham will tell you that he has tried to move through the waters when the cod are schooling and found it difficult to make headway. The early French explorers declared long ago

that the progress of their vessels was often impeded by schools of cod. I admit, however, that in restricted localities, in bays and inlets, you may decrease the total amount of fish by steam-trawling.

The question is one which seems to me to resolve itself largely into a question of scientific research. I think that trawling can be carried on safely in some localities without any possibility of damaging young fish, because they do not occur everywhere at great depths. Fry frequent shallow localities, so if you trawl in certain shallow areas, you must get young fish. It is therefore patent that you must determine in what areas trawling can be done. The Dominion Government has already established a three-mile limit for steam-trawlers. So productive are the fish that if there are any areas that are sanctuaries, they will be preserved. When it is known that a cod produces 5,000,000 to 9,000,000 eggs per annum, it may be readily understood what an advantage it has over land animals or fresh-water fish in propagating its species.

Distribution of Reports With respect to the issuing of reports, I do not know whether scientific men are naturally practical or not, but our reports have not been as widely circulated as they might have been. We do place fifty or one hundred copies in the hands of every worker. We also have a list of institutions to which we send copies, and I think the University of Fredericton is one of them. I fancy if Dr. Jones looks upon the shelves of the library of that university, he will find these reports. At the same time, I think we ought to have the names of any gentlemen interested in this work, so that we may circulate our reports as widely as possible.

Oyster Culture With respect to oyster culture, it has always seemed to me that there are certain problems that have to be settled before the scientific man can do anything. It is no use to tell people how to cultivate this or that if, when they begin to do it, someone else will get the benefit. Until you have a system of leasing the beds, so that the men who do the cultivating will get the benefit, it is useless to attempt to do anything. Our oyster beds have been spoiled because the public had claimed that they had a right to fish them out. Every time the oyster culturist has done anything to benefit a certain area, it has been undone in a few months by the area being thrown open to public fishing. The reports on oyster culture will be valuable only when a man who undertakes work of this kind is sure that he will get the results of his labour.

DR. JONES: But the oyster culturists can now secure leases of beds in Prince Edward Island.

PROF. PRINCE: A report was published some years ago by Mr. Kemp, oyster culturist, which was widely circulated and read with great interest, but, of course, no one followed the directions given. The situation then was such that the public only benefited, or, what is more to the point, no one benefited.

We have done a good deal of research work respecting food of oysters. Diatoms—largely specimens of minute microscopic vegetable life—have been found in the stomachs of oysters. Dr. Moore, of Washington, has told me that this is by no means their sole food, but that oysters take in a large amount of floating organic matter. That diatoms do form a large part of the food of oysters, is proved by the fact that many oysters are quite green.

Referring to the colour of the flesh of salmon, I may say that the popular taste is by no means a guide to the qualities of food. The humpback salmon, for instance, is a fish regarded with extreme contempt by everyone; I have seen twenty thousand of them dumped into the river from a cannery. When on the Coast with Dr. David Starr Jordan, I said I believed that the humpback was the best fish in British Columbia. He differed with me most decidedly. To put the matter to a test we procured a humpback from a cannery and had the cook on our steamer cook it. I declared the fish to be the best I had ever tasted, and the rest tried it as an experiment, and all pronounced it exceedingly good. That was a fish that everyone said was hardly edible. The spring salmon, one of the finest fish in British Columbia, was thrown away or given to the Indians by the cannerymen when white-fleshed. The Indian says he prefers the white salmon and that the white fish has a better flavour than the pink; he is not looking for appearance. I am afraid that Mr. Snowball, when he gets his red trout, is enamoured of the colour as well as of the flavour. The flesh of the humpback is excellent; the sockeye, when canned, however, makes the richest coloured, and the most marketable fish in the world.

As to the fish in the Miramichi, I think there is a flavour about the colouring matter there that is in their favour, but I doubt if they would bring a better price in the market if canned.

With respect to autumn fish used for hatchery purposes, I reported to the Department that they ought, in every case, to get the early run. Getting the early fish would, in many ways, be a great advantage.

With respect to the decrease of fish, I would say that in some cases it is impossible entirely to clean out or exterminate fish. This is certainly true of sea fish, but in the Great lakes the supply can be greatly reduced. The lobster has been pursued more perhaps than any

other fish, yet it is to be found in large numbers during some seasons. How is it? It is because the grounds around our coasts are so unparalleled that you cannot clean them out. I never expect to see the day when there will be no lobsters in Canada, although they may be so rare that, instead of being 30 cents a can, they may be \$1.50.

THE CHAIRMAN: I shall now call upon Dr. C. Gordon Hewitt to read a paper on "The Insect Food of Fresh-water Fishes."

The Insect Food of Fresh-water Fishes

Its Economic Importance in Relation to Fish Culture and the Conservation of Fresh-water Fish

BY

DR. C. GORDON HEWITT

Dominion Entomologist

ON first thought and without reflection, it may appear strange that an entomologist should have any advice or recommendations of practical value to offer on the subject of fisheries. In regard to the problems relating to insect pests, he is able to assist the farmer, the fruit grower, the forester, the medical officer and sanitarian, the housewife and others who, at some point in their daily occupations, encounter injurious insects; but in what manner, it may be asked, can the study of insects and its application have any bearing on the various problems affecting fish culture, such as the depletion, restocking and general conservation of our fresh-water fish supplies?

If I were preaching you a sermon and offering spiritual in addition to scientific guidance, I should choose as my text, and direct your attention to a passage of the eighth chapter of St. Luke where the parable of the sower is described. We read, as you may remember, that a sower went out to sow his seed. Some of the seed fell by the wayside, some upon rock and some among thorns; but all this seed failed to grow. Some, however, fell on good ground and bare fruit an hundred fold. "He that hath ears to hear, let him hear," the parable concludes.

I wish to call your attention to an aspect of fish culture and conservation which has been entirely overlooked in Canada, but it is one which is of such fundamental importance that we cannot afford to neglect it, a statement to which I trust you will agree. This aspect to

which I refer is the consideration of the bearing which the food of our fresh-water fishes has on their conservation. By the conservation of our fresh-water fishes, I mean, of course, their care and utilization to that extent which will enable us to make the greatest use of them to the advantage of the people generally.

**Extent of
Fresh-water
Fisheries** In speaking of fisheries and in discussing fishery questions, reference is usually made to sea fisheries. In most cases, our fresh-water fishes have suffered a neglect which their importance and potential value do not in the least justify. We should not forget, indeed we cannot forget if we will only glance at the map of Canada, the enormous extent of the fresh-water fisheries of this country. When it is realized that about 220,000 square miles of our territory consists of fresh water and when it is understood that the only product of this valuable resource is fish, the significance of the fresh-water fisheries to our people, especially to the millions who will live at considerable distances from the sea fisheries, will be more clearly appreciated. Consider Nova Scotia: about one-sixth of the area of this province consists of fresh water. It is estimated* that at least 7,000,000 lbs. of fresh-water fish of all kinds are taken annually in the provinces of Saskatchewan and Alberta in which at least 40,000 square miles of lakes and rivers are open to fishery enterprise. The value of the fresh-water fisheries of Manitoba for the year ending March 31st, 1912, was \$1,113,486.

**Their
Importance** The foregoing statements will bring to your minds the extent and value of the resource of which I am speaking. Is it not important then that we should seek to apply the correct principles of conservation, the greatest use with the least waste, to this inestimable resource? Not only is it important to the inhabitants of the cities that, in these days of rising prices and increasing cost of living and of food, we should make the best use of so valuable a source of food supply, but it is to my mind of still greater importance to the settler. We are bringing thousands of homeseekers annually into our western provinces. Many of these are compelled to settle in localities where meat is scarce and difficult to obtain. Is it not most desirable and important then that we should endeavour to make the nearby supply of fresh-water fishes as productive as possible for the benefit of the local farmer as well as of the fisherman who supplies the city markets?

* *Report of Dominion, Alberta and Saskatchewan Fisheries Commission (1912), Part II, p. 6.*

**Aquatic
Insect Life**

With these facts in our minds concerning the extent and significance of our fresh-water fisheries, let us consider what bearing the subject of the insect food of fresh-water fishes has upon their conservation. Those of my audience and others who are disciples of Isaac Walton, by using insects as their snares, tacitly acknowledge the importance of insect life in the economy of the life of a fresh-water fish such as the trout. The employment of imitation and real insects and their larvæ as bait for fishes is an acknowledgment by the fisherman of the fact that insects are the favoured food of fishes. The chief food of most of the fresh-water fishes is either directly or indirectly fresh-water insect life; I say indirectly because the larger fish may feed on smaller fish which, in their turn, feed upon the insect life. This reminds me of the cycle which I learnt when as a student of zoology I was studying marine zoology in the Irish sea, indicating how man indirectly feeds upon mud. Mud forms the food of diatoms, which, in turn, are eaten by small marine molluscs and crustacea, and upon these the fishes great and small feed, both directly and indirectly; finally man eats the fishes. Thus nutrition links up the chain of organic life and we see how dependent we and other forms of life are on lower or intermediate forms.

Fresh-water insects are chiefly confined to the shallower portions of fresh water. Here we find the larval stages of May-flies, caddis flies, dragon-flies, stone-flies and water-beetles, etc. They are comparatively soft-bodied and are readily eaten by fishes, both young and old. In the deeper waters, the species differ. Here the larvæ of the Chironomid gnats may be found usually in the mud. Some of these Chironomid larvæ have been called 'blood-worms' on account of their red colour. The free swimming colourless larvæ, known as 'Phantom larvæ,' of the *Corcithra* gnats are found at various depths. The majority of these insect larvæ show various modifications of structure and function which enable them to lead the aquatic life to which they have become adapted. Except in the case of water-beetles and certain water-bugs, they cannot breathe air and so their respiratory apparatus has been modified in such a manner as to enable them, like fishes, to breathe by means of gills. Some are provided with rows of leaf-like gills, others with filamentous gills; the bodies of some are flattened and they cling to stones, others such as the *Trichopterid* larvæ or 'caddis worms' shelter their soft, and to the fish, succulent bodies in protective cases of varied and amazing design and construction. The assumption of an aquatic life has led to the development of extraordinary methods of feeding, respiration and protection.

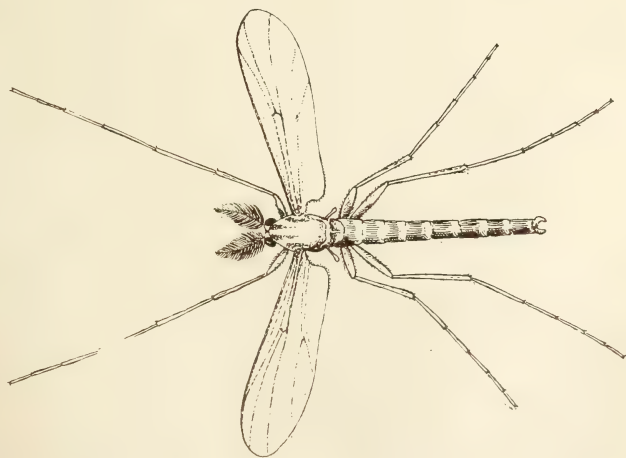


FIG.1

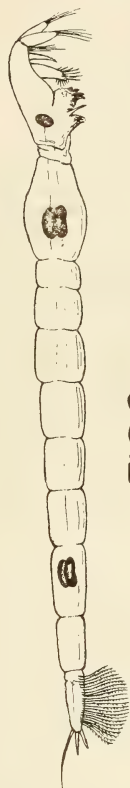


FIG.2

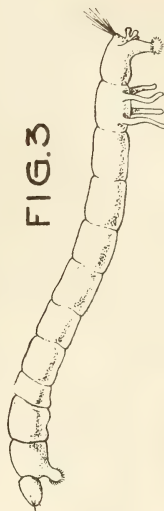


FIG.3



FIG.4

FOOD OF FRESH-WATER FISH (TROUT)

Fig. 1.—*Chironomus* : Adult Fly, Male.

Fig. 2.—*Corethra* larva ('Phantom larva').

Fig. 4.—*Trichopterid* larva in protective case ('Caddis worm').

Fig. 3.—*Chironomus* larva.

All aquatic insects are by no means useful in relation to fish culture. Certain of them on account of their carnivorous habits are positively inimical. The fierce larvæ of the *Dytiscid* water-beetles with their claw-like sucking jaws dearly love a juicy young fish, and certain of the water-bugs will not hesitate to attack young fishes several times their own size. When they do not prey upon the fishes themselves they devour their more defenceless insect congeners.

The extent to which fresh-water fishes feed upon aquatic insect life will be apparent to any fisherman possessing a little knowledge of insects, if he will only examine the contents of the stomachs of such fish as the trout. In this connection, I may call your attention to the results of an examination and analysis of the stomachs of twenty-five brook trout which was made in New York state by Prof. James G. Needham* who, more than any other investigator, has endeavoured, and with considerable success, to bring about a truer conception of the importance of the subject of my address. These trout were obtained from a pond controlled by the Adirondack hatchery. With the exception of two hundred and fifty small crustacea known as 'water fleas' (*Daphnidae*) devoured by one specimen, a few trout scales and one small fresh-water mussel, the entire food of the twenty-five specimens of brook trout consisted of insect life, and almost wholly consisted of the larval and pupal stages. The total number of insects found in order of their abundance was as follows: 2,906 *Chironomus*, 156 *Corethra* ('the phantom larva'), 14 trichopter larvæ ('caddis worms'), 2 dragon-fly nymphs (*Aeschna constricta*), 7 May-fly nymphs (*Callibaetis*), 8 water mites (*Atax crassipes*). This gave an average for each trout of the following: 116.24 *Chironomus*, 6.24 *Corethra*, 10 *Daphnids*, .56 caddis larvæ, .32 water mites, .28 May-fly nymphs and .08 dragon-fly nymphs. The first three species, namely, the *Chironomus* larvæ, the *Corethra* larvæ and the caddis fly larvæ formed the chief food of the trout.

Professor S. A. Forbes, in his study of fishes of Illinois† has pointed out the importance of these insect larvæ as fish food. He says, "Among aquatic insects, minute dipterous larvæ, belonging mostly to *Chironomus*, *Corethra* and allied genera, are of remarkable importance, making, in fact, nearly one tenth of the food of all the fishes studied." Further in his report‡ on the aquatic invertebrate fauna of the Yellowstone National park (quoted by Needham), he again refers to the im-

* Aquatic Insects of New York State, Part II. Food of Brook Trout in Bone Pond. Bull. 68, N. Y. State Museum (1903), pp. 204-217.

† Ill. State Lab., Nat. Hist. Bull. No. 2, p. 483.

‡ U. S. Fish Comm., Bull. XI, pp. 207-256.

portance of *Chironomus* and other fly (dipterous) larvæ. He records the following observations indicating the importance of these larvæ to young fish: "The pond was swarming with mountain trout (*Salmo mykiss*) a few of which I dissected for a determination of their food. One of these, an inch and a half in length, had eaten *Chironomus* larvæ and imago chiefly, the remainder of its latest meal consisting of other insect larvæ, not in condition to identify, and the Entomostrachan (*Polyphemus pediculus*). A second, an inch and a quarter long, had also fed on *Chironomus* in its various stages of larva, pupa and imago, but had made about a third of its meal of Entomostracha. Another, still smaller (.92 of an inch long), taken from the open lake among the small weeds growing on a flat, muddy rock, had filled itself with *Chironomus* pupæ only, as had still another of the same size. A third specimen from this situation had eaten more larvæ of *Simulium** than of *Chironomus* and a fourth had also eaten *Simulium* larva and another dipterous larvæ unknown to me. I may add here that other young trout, in a small swift rivulet near the Lake hotel were feeding continuously August 9, on floating winged insects, mostly, if not all, *Chironomus* and smaller gnat like forms." All the foregoing observations indicate what an important part in the food of the trout the larvæ of a single kind of insect such as *Chironomus*, which live chiefly in the deeper waters in the soft, silt-like mud and decayed vegetable matter at the bottom, constitute.

Interdependence of Food Factors Not only are the fresh-water fishes dependent to the extent to which I have referred upon insect life for their subsistence, but directly and indirectly, as is the existence of all aquatic life, on many conditions and factors existing in the water. They are affected by the physical and chemical conditions of the water. These conditions very directly affect the food of the fishes. Not only the insects themselves, but also the lower forms of life upon which they subsist, are dependent upon the physical and chemical factors and the nature of their environment. Certain insects cannot live where there is an absence of shore vegetation. In fact, the presence of aquatic plant life is essential to the existence of the majority of the insect larvæ frequenting, as most of them do, the shallower littoral regions. These facts, relative to the intimate dependence of the whole chain of organic aquatic life, of fishes, of insects, and of the lower forms of animal and vegetable life, in which the higher forms feeding upon the lower forms depend upon their presence, and, therefore, upon the factors governing such presence, serve to indicate the complexity of this problem of the food of fishes.

* The well known Black Fly whose larvae live in running water attached to stones.

**Fish Life
and Avail-
able Food**

In view of the foregoing statements and observations, it would almost seem an act of presumption if any great stress were laid upon the fact that fish life depends upon the nature and quantity of the available food, assuming the other factors to be favourable. Yet if you will only reflect for a few moments upon the methods we are employing in regard to fish culture, concerning which further reference will be made later, does not the underlying principle of the present methods and its inherent faith resemble those of the small boy who attempts to keep gold fish in a bowl of pure water? In modern agriculture, we can perform deeds that our forefathers would have considered impossible in the way of growing crops where, under ordinary conditions, such crops would not grow. But would any intelligent farmer sow grain or other crops, or fruit grower plant fruit trees on barren rocks or in soil devoid of plant food? He would certainly not be guilty of such foolishness or waste. On the contrary, he would supply the necessary plant food to the soil before sowing his seed. The re-stocking of fresh-water with fish is a precisely similar matter. Unless it is known that sufficient insect life is available, and that it is of the right kind to supply the needs of the fishes introduced, the re-stocking of fresh waters is a game of chance played with heavy odds against success. If fish life does not exist in a fresh-water area, and unless it is known with certainty that the causes of its absence are not natural causes, it would appear to be a positive waste to attempt re-stocking without, at the same time, supplying the necessary food or in other ways correctly adjusting the natural factors. Some people, like the small boy, have the idea that all that fishes require is water. Given a pond or lake or a stream, all you have to do is to turn in a few thousand eggs or fry and a beneficent providence will accomplish the rest.

**Depletion
and its
Causes**

Before considering this question of the re-stocking and introducing of fresh-water fish in relation to available food supplies, it is necessary to call your attention briefly to the causes of depletion. We learn* that in the provinces of Alberta and Saskatchewan the causes of depletion are eight, namely, over-fishing, illegal fishing (dynamite, nets, etc.) infraction of irrigation regulations, improper close seasons, lack of fishery officers to enforce regulations, sewage and other pollutions, drought and fishing through the ice. I would add at least one other cause, namely, the absence of available food, which cause would surely rank high in importance in some of our fresh waters. The causes of depletion and the absence of fish in fresh

* *Report of Dominion, Alberta and Saskatchewan Fisheries Commission (1912), Part I, pp 43-44.*

waters, may, I think, be divided into two main groups, which I would call artificial and natural. The first group of artificial causes would include over-fishing, illegal and out-of-season fishing, and sewage pollution; the second group of natural causes would be lack of food and physical and chemical changes in the water, and drought. The artificial causes have been produced by man, and, with determination, could be rectified by man. Some of the natural causes such as the available food supply, if that is the cause of the absence of fish, can also be attended to if the problem is approached in the right manner. Depletion is a more serious question in fresh waters than in the sea. The sea, by its enormous extent, permits migration; fished-out areas can be re-stocked by natural means. This, as a rule, is not the case in fresh waters. The areas are limited, there can be no such immigration of fresh supplies as in the case of the sea. If you take out more fish than are being produced or sustained, gradual depletion will follow. Further, fresh-water fishes are less prolific than sea fishes and therefore their rate of reproduction is not the same. As you cannot, for these reasons, rely on nature to replace the fresh-water fishes to the extent that the sea fishes are replaced, it makes it increasingly important to give the closest attention to the study of those means which are responsible for their life and growth, and of these means all will agree that food is the most important. Of this food, insect life forms the preponderating element.

**Re-stocking
Fresh
Waters** The importance of this question of the available food supply is made increasingly evident when we study the extent to which the re-stocking of great waters and the introduction of new species into new waters already takes place in Canada. For a number of years the Department of Marine and Fisheries has been carrying on work of this nature on a large scale, in addition to the similar work undertaken by numerous fishing and game clubs. Of the latter, we have no complete record, but the statistics of the Department of Marine and Fisheries for the year ending March 31st, 1912, are available and I will quote from these. The fish fry distributed in 1911 consisted (exclusive of salmon which I am not considering in this connection) of various species of trout and also of whitefish and pickerel. Altogether, 332,278,000 fry of these species were distributed. The following list and figures will give you an idea of the nature and extent of the distribution:

From the hatchery at Bedford, N.S., 105,000 fry of speckled trout were distributed in twenty lakes and rivers.

From the hatchery at Lac Tremblant, Que., 48,000 fry of speckled trout and 940,000 fry of salmon trout were distributed in eighteen different lakes.

From the hatchery at St. Alexis, Que., 600,000 fry of speckled, rainbow and grey trout were distributed in fifteen lakes.

From the hatchery at lake Lester, Que., 587,000 yearlings, fingerlings, and fry of grey and salmon trout were distributed in nine lakes.

From the hatchery at Magog, Que., 1,103,000 fry of grey, speckled and salmon were distributed in eighteen lakes and brooks.

In view of what we know as to the requirements of fishes in the way of food, the question naturally arises whether, in the above distribution, the available insect food was sufficient and of the right kind. Are we certain that the species of trout placed in a certain lake would find the right kind of food there and sufficient quantity of that food?

The Problem Stated This brings me to the chief point of my address, which is, that in order to carry out with the greatest measure of success the re-stocking with fish of waters which have been depleted, or the introduction of new species of fish into new waters, we must have information as to the available food for those fishes which are being re-introduced or introduced for the first time. The case of the farmer again crops up; no intelligent farmer would sow the seed of a crop on soil not containing the plant food necessary to the growth and fruition of such a crop. To bring forth a hundred-fold, the seed must fall on good ground. To ensure success in the introduction of fish fry, they must be introduced into waters in which it is known that food of the right kind and in sufficient quantity is present. If the farmer, wishing to sow his seed, finds the soil poor in nitrogen or some other necessary plant food, what does he do? Everyone knows he sows a crop such as clover, that will give the soil the necessary nitrogen, or, by many of the known methods, he supplies the deficiency, whatever it may be. In fresh-water fishery work the same methods should be followed. Associated with the fish hatchery there should be, if it is found necessary, an insect hatchery. I have no hesitation in predicting that when, in fishery work, a stage of advancement equivalent to the present state of advancement in agriculture is reached, we shall have the cultivation of the food of the fishes carried on in conjunction with the hatching and introduction of the fry. Prof. Needham, to whom I have already referred, has shown that the artificial culture of many of the insects constituting the food of fishes is practicable.

Fish Farming The culture of the insect food of fishes brings me to the concluding section of my address and that is the possibilities which lie in the idea of fish farming. To many people this will be a new idea, but I can assure you it is not; on the contrary, it is very successfully carried out in Europe. The people in this country, however, have not yet realized the inherent possibilities of this form of pisciculture. There are many farmers throughout Canada who have farms, parts of which are too low-lying and wet to drain, and, in consequence, such areas lie unproductive; and yet, if the farmers only realized the significance of the facts which I have been endeavouring to lay before you, they could make such useless and otherwise unproductive areas produce a crop as valuable as the crops produced by the best land on their farms, perhaps more valuable; that crop would be fish. If, in such low-lying wet lands, dykes and ponds were cut, some of the ponds serving as fish hatcheries, others as insect hatcheries, fish could be farmed as easily as poultry. With such fish ponds the farmer could supply the market, supply his family or afford fishing enthusiasts all the sport their hearts might desire, and, by these means, reap a valuable harvest from land which could not be utilized in any other way. Fish could be raised in localities where they were naturally scarce. That, also, is conservation,—the making of waste areas productive.

Need for Investigation Before the ideas which I have but briefly outlined can be carried out, there is required a large amount of work of an investigatory nature, and it is in this regard that the Commission should help to mould public opinion. Having studied this question of aquatic insects and their distribution some years ago in various fresh waters in England, I can say that no one realizes more fully than I, the extent and complexity of the problems which I have raised; but that is no excuse for doing nothing. Is it not a matter of surprise that our 220,000 square miles of fresh water in Canada should be served by a single fresh-water laboratory, that on the Georgian bay? If our fresh-water fisheries are to be conserved and if we are to make our fresh waters more productive, it will be necessary to have more fresh-water biological laboratories or stations established where those problems relating to the bionomics of our fresh-water fishes may be studied. At the recent annual meeting of the Entomological Society of Ontario held at Ottawa I moved the following resolution which was unanimously adopted by the Society:

“ THAT in view of the decrease in the supply of the fresh-water fisheries of Canada, the attention of the Commission of Conservation be

called to the important fact, which is being overlooked in the endeavours to replenish depleted waters by re-stocking and to stock new waters, that, as the chief food of many of our important fresh-water fishes consists of larvæ and adult insects, a study should be made of the available or possible food supplies in the way of insect life before attempts are made at replenishing or stocking waters; otherwise by stocking waters in which the food supply is not suitable or cannot be made suitable, large sums of money and considerable time and energy will be uselessly expended owing to fish being planted where the food is either insufficient or of the wrong character, as the conservation of our fresh-water fishes cannot be carried out with the greatest success until more knowledge is available as to their feeding habits and requirements, and the insect or other fauna and available food supplies of the waters in which they are living or which it is desirable to stock with fish; and that a copy of this resolution be forwarded to the Secretary of the Commission of Conservation."

Our present inactivity in this regard is due chiefly to two causes: first, a general lack of appreciation of the importance of the problem which I am discussing, and, secondly, the difficulty of obtaining investigators. Both of these I am convinced will be remedied by time, and at the present time we must have our sight sufficiently well adjusted to take a long-distance view of the needs in these directions. With these problems confronting us, we are compelled to look ahead and to point out, possibly in advance of our ability to undertake them, the necessity and importance of attacking problems which the advance of time and increase of population aggravates. This is a matter which affects the home seeker whom we are attracting to our shores in thousands and the people who live in cities. And how do we know whether it may not affect those causes which contribute to clear thinking on the part of the people of this young country? Fish as is well known contains such a constituent as phosphorus, which is an important constituent of brain matter and nervous tissue. This Commission and your Committee on Fisheries can do much, and in my opinion, more than any other body, to bring about the materialization of the ideas which I have briefly outlined. I commend them to your most thoughtful consideration in the firm belief that their ultimate adoption would prove of incalculable benefit to the people of Canada.

DISCUSSION

DR. BRYCE: Has the Committee on Fisheries any recommendations to make?

DR. JONES: We intend to bring up certain resolutions at the proper time, which I understand to be this afternoon.

DR. BRYCE: I am strongly impressed with the great importance of having the right men in charge of fish hatcheries, and of having a thoroughly scientific staff. That, it seems to me, is the point upon which the success of all fish-culture work hinges most. The question we need to take up is the practical side of getting that done, and that is why I asked the question. I wish to speak on the subject again if it comes up.

THE CHAIRMAN: I shall ask Dr. Fernow to give an account of the forest survey work he did for the Commission during the past year.

FOREST SURVEYS

DR. FERNOW: I wish to submit to you, as briefly as possible, a statement of two reports, one made and one now in the making, on two reconnaissances, the one into an unsettled region in northern Ontario, the other into what might be called the over-settled part of Ontario, in the Trent watershed—over-settled because much of it should not have been settled at all.

I shall first refer to the smaller expedition into a part of the Clay Belt of Northern Ontario. It was a very brief one, made personally in six days at the suggestion of Hon. Mr. Sifton, and treats of the section around Cochrane. I made a tour on a speeder, by which means I could see the country best, travelling east and west of Cochrane for 200 miles.

The first impression one receives is that it is a forest country. The next is that it is an under-drained country; it is all more or less swampy, due to the underlying stiff clay. The species of tree which occupies the country, almost to the exclusion of any other, is the black spruce. From that, the lumbermen present will know what character of timber may be expected. On the better-drained land near the river courses, there is good timber, due to the presence of white spruce, balsam of Gilead and aspen poplar. Fires have been remarkably well kept out of this section, but on the Timiskaming and Northern Ontario Railway from Englehart north, which was also observed to some extent, one travels through a burnt country. The Porcupine fire of 1911 has destroyed hundreds of square miles absolutely, and the territory that remains green is rocky jack-pine country.

I spent most of my time on the 200 miles east and west of Cochrane, and there the fire had been kept out remarkably well. I am

informed, however, that further east and west it did much more damage. The timber is disappointing. Every half mile along the 200 miles, I made a classification, noting the character of growth and figuring up afterwards the number of miles of each kind travelled through. Then proportioning the miles and assuming that the 200 miles along the railway exhibit average conditions, it appears that the country beyond the height-of-land does not contain more than from ten to fifteen per cent at most, of what may be called saw timber, which is found mainly on belts of better drained land, one-quarter to one-half mile wide, along the rivers. Thirty per cent to forty per cent will be capable of furnishing pulp wood by picking, and the balance—or nearly one-half of the country—contains no valuable wood of any character, not even fire-wood, because it is not more than three to five inches in diameter and is, therefore, a liability rather than an asset. The idea that the settler can find pulp wood on every acre must be taken *cum grano salis*. It is only on about 50 per cent of the land that he has saleable wood to help him out.

The soil also has not been very satisfactorily investigated, for, so far as I have been able to find out, there has, as yet, been no real investigation made in the field, except the few laboratory analyses made in the laboratory of the Ontario Agricultural College at Guelph. What the analyst himself said in 1906 is still true: "The important question, the one concerning the suitability of the soil for producing the ordinary farm crops in paying or even sustaining quantity, has not, as yet, been answered." He then reports analyses of eighteen of what he calls the more promising soils, and shows several of them to be undesirable and none of them, with one exception, "comes up to the standard of what we expect from a virgin soil." Whatever the chemical composition of the clay, in the end the physical conditions, especially the relations of the clay soil to the amount of overlying muck or raw humus, which can be studied only in the field and which varies from section to section, is the deciding factor as regards the manner of treating the soil for permanent agricultural uses. Whether there be six inches or six feet of the muck above the clay makes all the difference. I call attention to this need of local examination, because the country is filling up with settlers, and it is essential that they should be systematically directed and have the advantage of expert advice in order not to waste their efforts.

Here Dr. Fernow read his formal report, which follows:

Conditions in the Clay Belt of New Ontario

BY

DR. B. E. FERNOW

Dean, Faculty of Forestry, University of Toronto

PURSUANT to your wishes I have made a rapid inspection of conditions along the National Transcontinental railway from Cochrane east and west for about 200 miles, and have pleasure in submitting the following statement.

Through the courtesy of Mr. H. M. Balkam, District Engineer, a motor car (power speeder) was placed at my disposal. This method of independent travel coupled with fair weather for at least four days afforded an unusually satisfactory opportunity for seeing conditions along the line, especially as at the season chosen (the week from October 15) the underbush is leafless. At the end of my trip, however, I was stalled for two days in one of the engineers' residences by the first snow of the season—15 inches on October 22. Besides this personal inspection, I had ample opportunity to overhear men familiar with the country.

Allow me to say at the very outset that I believe I have ascertained important facts as regards the condition of a part of the so-called clay belt, which, if properly realized, may be useful in its development.

FOREST FIRES

The line for 86 miles east of Cochrane is practically free from any serious damage from fires. Whatever burned areas were seen, some five or six spots, are small. They are close to the track, and, with one exception, are not more than a hundred yards or so wide.

The line for 110 miles west of Cochrane has suffered more. Not only are burnt spots more frequent, but in several cases the fire has spread over larger areas. Especially the mileage 50 to 60 miles from Cochrane shows extensive burns. In most cases, however, the woodland burned was of inferior type.

On the whole, for this section of the road, it can be said that it has been unusually well protected. I am informed that a very extensive fire occurred about 180 miles west from Cochrane in better timber, and that, on the Quebec side, farther east, damage by fire has also been more extensive. The fact that winds in the summer are usually from

the south accounts for the northern side of the tracks being more frequently burned. This also indicates the cause of the spread of fire as started from locomotives. To reduce the danger an additional 25 feet of fire lane has been cut out in spots by the contractors. It is very doubtful in my opinion whether this wider opening is an advantage, since it only exposes a wider strip to the drying effects of sun and wind. Indeed, since no mineral soil is exposed, and no attempt is made to prepare this strip, covered with highly inflammable vegetable matter, for the purpose of a firebreak, it only increases the fire danger.

CHARACTER OF THE COUNTRY

The country, as far as seen, is slightly undulating, occasionally hilly, and, sometimes, for considerable distances, flat. The one feature which impresses one most is the swampy condition of this region. In spite of the many rivers and minor water-courses, it is poorly drained; and, singularly enough, the swampiest level areas may be situated on elevated points rather than in depressions, a circumstance which will facilitate draining operations. The best drained sections are found along rivers (although not always) in belts of a quarter to half a mile in width, and on gravelly or sandy hills.

While a greater portion of the soil is of a clayey nature, the hills are largely sandy or gravelly deposits, glacial drift with small boulders; only occasionally does the rock come to, or near, the surface, as exhibited in the few rock cuts on the railway line. The clay soil is, however, by no means uniformly of the same character. It varies in texture, colour, character of admixtures, stratification, and chemical composition, and the depth, especially of the overlying muck or peat layers varies, and, therefore, is of varying agricultural value. This fact is apparently not fully realized in the attempts at settlement or colonization. Indeed, there seems to be a widespread misconception that the whole country is immediately fit for farming.

So far as I can find out, with the exception of some chemical analyses of a few soils of this region made in the laboratories of the Ontario Agricultural College, no real soil examination in the field has been undertaken. Such chemical analyses in the laboratory, as is well known, have only a very limited use as first indications of possible agricultural value, which finally depends to a much larger degree on physical conditions that can be ascertained only in the field.

It is then still true, what the analyst himself stated in 1906:*

* *Thirty-Second Annual Report of the Ontario Agricultural College*, 1906, page 58.

“ The all important question, however, the one concerning the suitability of its (Abitibi district) soil for producing the ordinary farm crops in paying or even sustaining quantity, and the potentiality of the same for supporting an agricultural population for any length of time has not, as yet, been answered to any satisfactory extent.”

The chemical analysis of eighteen of even the “ more promising ” soils shows several of them as “ undesirable, and none of them except No. 8 comes up to the standard of a virgin soil.”

It is a striking, though perfectly explainable fact that the soils which are reported as the poorest, nevertheless, bear good timber. This fact simply accentuates another well-known fact, namely, that tree growth is largely independent of chemical composition of soil, but indicates merely more or less satisfactory drainage conditions. Agricultural use of the soil is, however, also influenced by these conditions, and liability to frost is very much increased by insufficient drainage.

The climatic conditions of the region are also still imperfectly known. A thirteen-year record at Abitibi shows the average date of the last frost in spring as June 8 and the average date of the first fall frost as September 14, denoting a rather short frostless season—the growing season beginning about three weeks later than in Old Ontario, and also closing earlier. Frosts in July and August are also to be anticipated. The climate in this latitude is northern, with its usual short hot summer and long severe winter. Climatically, the distribution of tree species also differentiates this section from that south of the height-of-land. This is shown by the absence of red oak and sugar maple, a certain indication of difference of climate.

Nevertheless, the more hardy root and grain crops mature. Abundant sunshine and sufficient rainfall during the growing season will produce excellent hay crops, and, when larger areas of the country are opened up to the warming sun, and are drained, some of the deep fertile soils may produce even less hardy crops.

FOREST CONDITIONS

Composition.—The whole country is densely wooded. Although there are twelve or thirteen tree species* found in this northern forest, practically only two species—the black spruce and the aspen—form the bulk of the composition, giving a very uniform aspect to the country.

* Black spruce, white spruce, balsam fir, tamarack, jack pine, cedar, red pine, white pine, aspen, balm of Gilead, paper birch, black ash, mountain ash.

For many miles, black spruce is the sole occupant of the poorly drained soils. Into these stands of pure black spruce, here and there, tamarack—mostly dead trees, as a result of insect damage long ago—may enter. Lately, this species is beginning to revive and especially to seed the openings made by railway construction. The presence of any of the other species is an indication of improved drainage conditions. Next to black spruce the most frequent and the most important species is the aspen poplar (here called white wood), and, as the drainage improves, not only does this species improve in numbers and size, but also balm of Gilead (balsam poplar), white spruce and balsam fir appear. This latter is, however, not frequent and is usually wormy. Cedar is rarely seen and is usually of poor development. Birch (paper) is also not frequent and is less thrifty than the poplars. Jack pine occurs locally, usually as indicative of overdrained, gravelly soils, which it is apt to occupy exclusively, although it occurs sporadically in mixture with other species. The next most valuable of these rare species, the white spruce, represents hardly 20 per cent of the spruces. The two important timber trees, white and red pine, occur in some very limited localities farther south. The sporadic occurrence of black ash is only of botanical interest.

A very rough estimate of the occurrence of the different species would give 60 to 70 per cent to the black spruce, 10 to 15 per cent to the white spruce, about 15 to 20 per cent to the poplars, and 5 per cent to the rest.

Commercial Aspects.—While the country is densely wooded it is by no means all 'timber.' Indeed, from the point of view of saw-mill supplies, the woods are disappointing. Even for pulpwood the supply is not what the uninitiated may suppose, and what has been believed to exist.

The early explorers travelled by canoe, and, hence, reported only the better developed timber of large-sized white spruce, aspen, balsam poplar, which skirt the rivers on the well-drained portions in quarter to half mile belts, without realizing that, in the swamps beyond this belt, the bulk of the forest growth is black spruce of small size. There is also an idea abroad that the small trees which cover vast areas are young trees, the result of recent fires. While in some cases this may be a correct diagnosis, it is not so in the majority of cases seen, in which the small trees are stunted, of considerable age and extremely slow growth, the result of poor drainage, as can be readily established by counting annual rings.

An attempt was made to classify from the standpoint of use, the forest growth visible from the railway. Even a layman may readily

recognize at least three development classes, distinguished according to size, namely, the most frequent maximum heights and maximum diameters, not considering the 'giants,' i.e., the unusual sizes which may occur occasionally in any class. All growth remaining below 40 feet in height and below a 5-inch maximum diameter was classed as scrubwood; that above these dimensions, but remaining mostly below 60 feet in maximum height and 8 to 10 inches in diameter, as second class; and that above these latter dimensions, making an *average* of 80 feet in height and 12 inches in diameter, as first class. In nature, these classes grade into each other, and to allow for these intermediate gradations two classes were interpolated between each of two main classes, namely those somewhat poorer than the best, and those somewhat better than the class below, the more or less frequent occurrence of the main class dimensions serving for these interpolated classes, so that, altogether, seven classes were distinguished.

To check the judgment, a few measurements of diameters on the stumps to be found in the clearings for right of way were made, which measurements, indeed, led to the classification. These stump areas in front of the forest type itself were also used as checks to classify the type properly, since along the railway the better sizes have been culled.

With these classes, expressed by numbers, in mind, a record of the character of the woods seen from half-mile to half-mile was kept along the entire line of 196 miles travelled. This record added up would give the number of miles of each class, and, translated into percentages, would give a fair idea of the relative proportion of the classes to be found in the country at large, provided the conditions along the railway represent the average conditions of the country. This question was discussed with competent informants, who seemed to agree that the run east of Cochrane was through poorer country than the average, but that the run west was through average country. As a matter of fact, from the detailed record the reverse seems true, except that on the west run no opening muskegs occur, while one per cent on the east run is of that description. It is this latter fact, undoubtedly, that has left the impression on the people interrogated as to the poorer character of the east run.

The results of this enumeration permit the following statement: Hardly 10 to 15 per cent of the forest is of the first class, i.e. containing sizes fit for logging. From 35 to 50 per cent of the area may by picking furnish small-sized pulpwood. From 35 to 45 per cent of the area is, from the standpoint of wood supplies, useless: it is either muskeg, near muskeg, or scrubwood of a size hardly fit for fuel. The

record in seven development classes (given in percentages) ran as follows, beginning with the best lands: 4, 5, 14, 21, 17, 18, 22; the last two figures representing muskegs, open and with scrubby growth.

In corroboration of the statement respecting the relatively small value of the timber, I may cite the statement based on cruising of one of the lumber companies situated on what are considered two of the best townships, and which, therefore, may be accepted as fairly representative of the better class lands, including river banks. Thirty per cent of their holdings are found unproductive, the productive land running 8 cords of pulpwood of 8 inch average diameter, or, possibly, 4000 feet B. M. per acre.

From these findings, it will appear that the hope held out to settlers, that they may sell pulpwood, is only a very conditional one; if they are settled on the better half of the land and within reach of a market they will be able to utilize small sizes.

In further corroboration of the probability that the proportion of agriculturally available soil may be approximately correct I may cite the testimony of a timber agent who on a map has indicated conditions from township to township travelled by him. In seventy townships (taken in sequence) which were shown on the map, twenty-nine were noted as clay, ten as sandy, seventeen as muskeg or near muskeg, four as swampy or lowland, and ten as jack pine land.

Conditions South.—A similar record of forest conditions was kept from Cochrane south, only not so precise. Here, fire has done much damage. Hundreds of square miles can be seen on this run, absolutely dead, the result of the Porcupine fire. A run of 12 to 14 miles through this fire belt is made from mile 194 to 206. Around Matheson the woods are all destroyed. Another extensive fire area, dating 25 to 30 years back, now recuperating, is crossed by the railway for another 15 to 16 miles to the height-of-land south from mile 192. Brush forest of jack pine, aspen and birch is practically all that can be seen on the south side of the height-of-land as far as Englehart, with, now and then, an island of better class. The country from Englehart north beyond Bourke is rough and rocky. Altogether, the run of 120 miles from Cochrane to Englehart does not, by any means, raise, but rather depresses, the estimate of the proportion of good timber.

Agricultural Outlook.—Disappointing as are the timber conditions, the outlook for agricultural development is undoubtedly bright, although here, also, too sanguine expectations are being entertained, and should

be guarded against. A classification of lands is here as needful as with the timber. Most, if not all the land may, at some time, be capable of being turned into farm land, but, unless the early colonization is properly directed, disappointment will be experienced through the irresponsible settlement of good, bad, and indifferent locations.

While the timber conditions are not necessarily indicative of agricultural soil values, they are so to some extent. The variation in tree development, as stated before, is mainly due to variation in drainage conditions: the best timber is found on the best drained lands (along the rivers); the shortness of the scrub forest is due to the water-table being close to the surface; and the intermediate heights denote merely difference in depth of soil—depth to water-table. Agricultural requirements take into consideration (more than forest growth) the mineral components of the soil; hence the clay lands which are not too stiff, may be good farm lands, while they may not be favourable to forest growth, and sandy deposits may produce good timber, although for farm use they may be 'too thin.' But the same trouble which dwarfs the tree-growth is also an objection for the farmer—the lack of drainage. This condition brings with it other unfavourable conditions in this northern climate, namely frost conditions. Fortunately, many of the poorly drained black spruce swamps are, as stated before, situated on elevated plateaux, and hence the possibility exists of lowering the water-table or draining the land readily. Such draining, however, can, in many cases, not be profitably done by the small farmer, but must be done on a larger scale to be successful.

In the real muskegs or moss barrens, probably most of the soils require special treatment to make them permanently available for farm use—at least, if the experience with similar conditions in other countries may be relied upon. It is well known that muck soils like these may for a time produce excellent crops, and then suddenly decline, unless they have been mixed with the underlying mineral soil or been treated with fertilizer. Hence the thickness of the humus layer above the clay is in itself of moment in rendering farming more or less difficult. Altogether, there is enough variation in agricultural values to make investigation and proper direction of the colonist desirable. It should be realized by him that not all soils are farm soils, and, especially in this climate, that annually profitable crops are not assured. Eventually, by the removal of the forest cover, not only will the soil become drier, but warmer; frost which at present remains in the soil for most of the season, will become rarer, and crops become more certain.

RECOMMENDATIONS

I desire to reiterate that the above statements are the result of an altogether too brief and confined inspection. It should also be fully understood that these judgments do not refer to the clay belt as a whole, but merely to the small portion, north of the height-of-land, along the 200 miles of the National Transcontinental railway. I have taken special pains to explain how the judgment has been arrived at. My first recommendation would be to have this judgment more fully verified, for it runs counter to many other opinions as to the value of this part of the clay belt. My judgment, briefly summarized, is that probably 50 per cent of the area involved does not contain any wood values, and that probably the same percentage of it is, under present conditions, undesirable to open for settlement. Whether these proportions are more or less correct matters little, if only the fact is realized that more systematic and careful direction of settlement is highly desirable.

At present, as I understand it, townships as they are surveyed are open for settlement without differentiation. Many a settler will be misled into taking up unsuitable lands, and the experience of old Ontario (on the Trent watershed) will be repeated, namely of abandoned farms or else a degenerated population.

If these findings are communicated to the Provincial Government, that Government may perhaps be induced to consider the following recommendations:

1. A classification of lands regarding their fitness for farm use should be made, and settlers be kept out of the undesirable portions.

This is most easily done by attaching a proper person to the township surveys, who can roughly classify and describe the lots as they are laid out.

To fit persons for the service of classification, a 'soils' expert should first make a thorough study of the soils in the field, and devise the points for classification.

The opening for settlement should be made by lots rather than by whole townships, and judicially placed windbreak belts should be excluded from settlement.

2. The fuel question will, sooner or later, become an important one, and forest reservations are, from this point of view, desirable. For this purpose the lighter soils may serve. It is not necessary to say that protection against fire, and especially judicious use of fire in clearing, should be provided for.

3. A co-operative scheme of systematic draining should be inaugurated by the Government, after thorough study of what has been done elsewhere in this direction. Sweden, where somewhat similar conditions exist, and where systematic work in this respect is being done, furnishes one of the best examples to study.

4. Not a model farm, but experimental farming under the variety of conditions met, might very properly be undertaken by the Government to find out what treatment is necessary on the different soils, what crops can be expected to grow successfully, and to observe at the same time the variation and changes of seasons.

5. In connection with experimental farming, a few small and inexpensive experiments in the effect on tree growth of lowering the water-table and thinning out dense spruce stands might be undertaken, to find out whether better wood production could be induced by such practices.

Altogether, it will be wise and in the line of rational use and conservation of resources to proceed more systematically and with more knowledge than has been apparently done so far in the settlement of this exceedingly valuable portion of the province of Ontario.

In conclusion, allow me to refer to one of the enterprises, on the wisdom of which the Provincial Government should be congratulated. It is the contract with the Ontario Colonization Company, of which Mr. W. K. Jackson is President. They have undertaken to colonize systematically two of the better townships after or while logging the same. It is, I believe, the first large enterprise of this kind in the region. The firm, realizes that it has entered upon a task by no means easy, but I can testify that a *bona fide* beginning has been made, and the practicability of the same will soon be demonstrated.

MR. MCCOOL; Did you visit the Experimental farm at Monteith?

DR. FERNOW: No, I did not. That is a very different proposition from mine. It is a first class farm, selected for a model farm rather than for an experimental farm.

MR. MCCOOL: I am told it is very successful.

DR. FERNOW: My point is that there should be many small locations on the various soil conditions found in the country, for the purpose of demonstrating how each of them is to be treated.

TRENT CANAL SURVEY

DR. FERNOW: The reconnaissance of the watershed of the Trent canal made for the Commission last summer was brought about through the efforts of Mr. J. H. Burnham, member of Parliament for Peter-

borough, who invited me to go over the ground and to suggest what should be done to recuperate this region. It was decided that in order to formulate any recommendations of value, it would be necessary to have a close survey.

Interests
Involved

There are three or four interests involved which will justify the work done. First of all, the Dominion is interested in the canal in which some ten million dollars has been spent, and in the watershed which is to furnish the water and the power, and which, therefore, should be under the control of the Government. It is not under such control as yet. Down to 1905, all the back waters and the lakes, were under the control of the Provincial Government and the dams north of the lakes had been built by that government for the purpose of assisting the lumber industry; for this was a great pinery some time ago. In 1905, the authorities in charge of the canal realized that it was necessary for them to have charge of these waters, and by order in council the Province ceded the water surface to the Dominion Government and, in addition, allowed it to buy land alongside the lakes and watercourses for 50 cents an acre. The Dominion Government thus can acquire as much land as it desires at that rate. So far, only 2,000 acres have, in this way, come into the hands of the Federal Government. The Province still owns in unpatented lands about one-half of the area under consideration, and therefore, there is a Provincial interest. Then there is the interest of the country at large, for this is a sample area of conditions that exist on thousands of square miles in Quebec and Ontario, New Brunswick and Nova Scotia, of cut and burned lands, concerning which the question arises: What can be done for recuperation? Finally, there is a humanitarian interest. There exists a population on farms that ought never to have been turned on to farms, and a degenerate population is growing up there of the people who are either not enterprising enough or have not enough financial ability to move away. When the lumber industry was flourishing, even little pockets of farms could be farmed to advantage; for potatoes, oats and hay could be readily sold to the lumbermen, but now that the lumber industry is gone and the thin soil is exhausted, the farms are being abandoned. In 1911, 195 farms were for sale at an average price of 6 cents per acre for non-payment of taxes; so you may imagine that they had never been very good. There is quite a population that ought to be taken care of, people who could elsewhere make a good living and become an industrial population, while here they become really more or less degenerate.

**Area
Surveyed**

This watershed comprises about 3,000 square miles, including waters. Of this area 2,100 square miles is land area. Of this, 310 square miles are owned by one company, which secured it some thirty or forty years ago for a mere song. This area is, at present, to a large extent, still virgin forest—hardwood forest with spruce, hemlock and pine intermixed. As we did not make a detailed inspection of this area, our survey included only 1,800 square miles, or about 1,200,000 acres. The watershed is divided into nine basins, two of which are largely occupied by this Company. The detailed results of the survey will be published separately.

**Classifica-
tion of Lands**

They will reveal the fact, that the farm area comprises only 11.4 per cent; that 5 per cent is barren and recently burned; that less than 700 acres of the 1,000,000 acres of forest is untouched virgin forest; that 314,000 acres, or one-third is pure hardwood forest, for the most part severely culled; that nearly two-thirds of the forest area (61.8 per cent) was originally a pinery, but over 600,000 acres of it have been burned over, all but 75,000 acres being burned over more than once, and so severely that practically the pine is killed out, poplar and birch having taken its place. It can be demonstrated that at a moderate valuation these fires have killed prospective values of not less than eight million dollars; and that prospective values of over eight million dollars are still in sight on these fire swept areas, that can be saved if further fires are prevented. At least 60,000 acres have been turned into absolute rock barrens.

Recommendations for methods of recuperation will accompany the report.

SIR EDMUND OSLER: How long does it take spruce or poplar to grow up to be of value for pulp?

DR. FERNOW: The poplar must be forty years old. Pine would have to be eighty years old to be suitable for cutting into lumber. Spruce may be fit for pulpwood in that time, but for saw logs it would take at least a hundred years.

SIR EDMUND OSLER: How many settlers are there in this district?

DR. FERNOW: We did not make an enumeration, but we found that there has been a decrease of population in the last ten years of 15 per cent, as compared with a 4 per cent general decrease in the rural population of Ontario. This is, of course, a satisfactory solution of the problem. Yet, there are still at least 100 to 150 families, say 500 people, possibly 1,000, who should move elsewhere.

THE CHAIRMAN: What is the area of the Trent watershed?

DR. FERNOW: Three thousand square miles, of which 1,000 is water surface. That is all above Peterborough.

MR. BURNHAM: What conflict is there between Dominion and Provincial jurisdiction?

DR. FERNOW: I do not think there is any. The Province, of course, is supreme, but by order in council of 1905, the Provincial Government handed over the water surfaces to the Dominion Government and gave it an opportunity to buy any additional land for 50 cents an acre, and owing to that fact, when the Dominion Government came into possession of the back lakes and works, it completed the works, built new dams and renovated old ones, thus doubling the water-power at Peterborough.

The Commission took recess.

Wednesday Afternoon Session

The Commission met at half past two o'clock on Wednesday afternoon, Hon. W. C. Edwards in the chair.

THE CHAIRMAN: I shall now call on Mr. F. C. Nunnick to outline the work done under the direction of the Lands Committee during 1912.

COMMITTEE ON LANDS

MR. NUNNICK said:

For 1912 the work of the Committee on Lands has been largely as proposed at the annual meeting held at Ottawa in January, 1912. It may be outlined as follows:

1. The continuation of the diagnosis of agricultural conditions by means of the agricultural survey work, in order to obtain further reliable data for guidance in future operations.
2. The extension to the Maritime Provinces of the alfalfa illustration work, which was conducted in Quebec in 1911.
3. The establishment of illustration farms in the various localities in the Dominion where the investigation or survey work has been carried on.

AGRICULTURAL SURVEY

The agricultural survey work this year has been more comprehensive than last year and has included the following:

1. An investigation of areas under crops, crop rotation, crops used, seed selection, varieties used, amounts seeded to clover and alfalfa,

comparison of yield with that of ten and twenty years ago, the uses of manures and fertilizers.

2. An investigation of weed pests, insect pests, and plant diseases, with special reference to their prevalency and the time when they were first introduced to the farm, whether increasing or decreasing, estimated loss, causes responsible for the foregoing, and the preventive measures adopted.

3. An investigation of the fuel, power and water supplies. Special attention has been paid to the length of time the fuel supply will last; to the afforestation of present waste land and the results of planting, where any has been done; the motive powers for house, farm and field work; the source and location of water supply for house use and for stock, the distance from possible sources of contamination and how conveyed to the house; and conveniences in the houses for conserving human energy.

4. The obtaining of information regarding the amount of stock kept and sold annually; the amount of hay and grain sold and fed annually; the labour problem on the farm; the drawbacks to profitable continuation of the present systems of farming; and the branches of farming specialized in.

About twenty men have been employed to circulate printed question schedules among the farmers in the representative districts selected for the survey. From personal observation by these men and the testimony of the farmers, the information has been obtained and is being tabulated ready for printing.

ALFALFA INVESTIGATION

The work in connection with alfalfa in Quebec and the Maritime Provinces is the investigation into the conditions under which this crop can be successfully grown in different districts throughout these Provinces. The work is being conducted under the supervision of competent men either from the agricultural colleges or the provincial departments of agriculture.

The following is the report on the condition of alfalfa
Quebec illustration plots in the counties of Huntingdon, Brome, L'Assomption and Chicoutimi in November, 1912. This work was carried on under the supervision of Prof. Klink of Macdonald College, by whom the report is written:

HUNTINGDON.—The season of 1912 was very unfavourable for newly-seeded alfalfa on the heavy clay soil of the Huntingdon district.

Heavy rains in spring and early summer, followed by the severe drought of July, subjected the plants to an unusually severe test. The plots seeded in August, 1911, were better established and gave very satisfactory returns, considering the few months they have been seeded down. With but one exception, three good cuttings of hay have been taken from each piece and the stand, which has been good from the start, has improved considerably during the summer. In every instance, the farmers who are co-operating with the Committee on Lands are well pleased with the results.

The alfalfa on the farm of Mr. H. S. Tannahill, Trout river, came through the winter of 1911-12 in fairly good condition. In a few spots, the frost heaved a number of the plants. With the continuous wet spell during May, the alfalfa, on the lower portions of the plot, suffered, and the plants became weak and light coloured. The wet spell was followed by an exceedingly dry one and the soil, which is a heavy clay, baked very hard. This retarded the growth of the alfalfa so much that the second cutting, instead of being cured as hay, was cut and left upon the ground as a mulch. With the frequent rains during August and September, the alfalfa showed a marked improvement, the plants becoming more vigorous and darker coloured. The following are the dates of cuttings and yields:

First cutting, June 25th; yield, $1\frac{1}{2}$ tons.

Second cutting, July 24th; cut and left upon ground.

Third cutting, Sept. 6th; yield, 1 ton.

Mr. Tannahill, when asked what he thought the possibilities were for growing alfalfa in his neighbourhood said:

“ With one year’s experience with alfalfa, I think the possibilities of alfalfa growing in this section are very good, the alfalfa on my plot has done remarkably well considering the season.”

On the farm of Mr. J. Cunningham, three cuttings were secured this year. The yield, although not heavy, was satisfactory. The crop was badly checked by the severe drought in July. The following are the dates of cutting and the yields of hay:

First cutting, June 17th; yield, 1 ton.

Second cutting, July 22nd; yield, $\frac{3}{4}$ ton.

Third cutting, Sept. 10; yield, $1\frac{1}{4}$ tons.

The third cutting could not be cured on account of the continuous wet weather, and, as a result, was lost. The stand has improved during the summer and the plants have become more branched and more vigorous.

Mr. Cunningham when questioned regarding the possibilities of alfalfa in his section, said: "From the experience I have had with this crop during the past three years, I think the possibilities of alfalfa in Huntingdon are very favourable."

The stand on Mr. R. Pringle's plot has been very uniform from the outset. This piece came through the winter in splendid condition. Three cuttings were secured this year and all of them were made into hay. The following are the dates of cutting and yields:

First cutting, June 22nd; yield, 2 tons.

Second cutting, July 23rd; yield, 1 ton.

Third cutting, Sept. 16th; yield, 1 ton.

Mr. Pringle when asked his opinion of the value of alfalfa in his district said: "My experience with this crop is very limited, but from the results of the past year I am extra well satisfied with it and intend in the future to devote more land to this crop."

BROME.—In the county of Brome, where, it will be recalled, the three plots seeded in 1911 were total failures owing to the acidity of the soil, excellent stands have been secured this year on every one of the six plots sown. As a nurse crop of barley was used on all the illustration fields in this county, no trouble was experienced from weeds, although the alfalfa was somewhat checked through the inability of the co-operators to harvest the nurse crop promptly owing to the prolonged wet weather.

L'ASSOMPTION AND CHICOUTIMI.—The illustration plots started with alfalfa last year in the counties of L'Assomption and Chicoutimi have been continued during the past summer. Serious difficulties, however, have been experienced. The extremely unfavourable season caused the pieces which were sown last spring to be, for the most part, a failure. This is especially true on the undrained land, where, for several days, or, in some cases for weeks, at a time, the water remained standing on the fields. As a result, the stand in many cases is very poor.

At the opening of the season, it was thought advisable to change the location of one of the experiments, as Mr. Joseph Tremblay of Chicoutimi had not sufficient time to prepare the land according to our directions. The work was, therefore, transferred to the seminary farm where a well prepared piece of land was available.

Thorough preparation of the soil was, in every case, insisted upon. All plots were ploughed twice and the necessary surface cultivatings were given to ensure a good seed bed and to free the fields from grass and weeds.

In L'Assomption, one piece was sown on the 12th of June and the other two on the 18th of July. In Chicoutimi, two pieces were sown on the 20th of June and the other two on the 5th of July. A very high percentage of the seeds germinated and grew remarkably well for a few weeks, but this growth was checked and a number of the plants were killed during the long period of rain and cold weather which followed.

No sooner did the alfalfa stop growing than weeds in considerable numbers made their appearance. Of these, chickweed and mustard were the worst. Wherever a nurse crop of barley was used, the injury caused by the presence of weeds was very slight; but where no nurse crop was sown the weeds had, in some cases, smothered out much of the alfalfa by the time killing frosts came.

In my report on the condition of the 1911 seeded plots, which I prepared for the Committee in June last, I stated that only one field survived the winter in L'Assomption. Mr. E. Landry, on whose farm this field is located, took three good cuttings of hay off this plot the past season. These three cuttings totalled four and one half tons of cured hay. Naturally, Mr. Landry is enthusiastic over his success, and is planning to put in a considerable acreage next year. Several farmers in his locality have prepared land this fall which they intended seeding down to alfalfa in the spring.

While the results of the work in these two counties are far from gratifying, the fact must not be overlooked that, with few exceptions, the new stands of red clover in the districts where the illustration plots are located are complete failures. One would not be justified, therefore, in concluding that alfalfa cannot be successfully grown in these two counties.

SUMMARY.—During the spring and summer of 1912 eighteen plots of one acre each have been sown. Of this number, nine have come through in good condition. The stand on the remainder is so poor that it is not at all probable they can withstand the winter.

While the proportion of loss is high, it should not be forgotten that, on a number of farms where the alfalfa stand was good, red clover was a complete failure. Without exception the alfalfa has done fully as well under adverse conditions as has red clover.

(Sgd.) L. S. KLINCK

Prince
Edward
Island

In Prince Edward Island, the work was supervised by J. A. Clark, Superintendent, Experimental Farm, Charlottetown. The following is his report:

In June, 1912, 330 lbs. of alfalfa seed was received from the Agriculturist of the Conservation Commission. This was dis-

tributed to 60 farmers in 5 lb. lots. The three men who are conducting illustration farms for the Commission were given 10 lbs. each.

At Farmers' Institute meetings in different parts of the Province the question of giving this fodder plant a trial was discussed and in each Institute visited, three volunteers were asked to undertake the work. Later, at the Farmers' Institute picnics to the Experimental Station in July, other groups of three men, each from a certain locality, arranged to undertake the work. A few men, whose names were suggested by the Agriculturist of the Commission and who succeeded in inducing two of their neighbours to undertake the work with them, were supplied with seed.

In each locality selected, at least one man was given orally all the information that was available. Bulletins on alfalfa culture were supplied to the investigators when requested. The men who undertook the investigation were advised regarding the preparation of the soil, location, drainage and care of the plot, either personally or through a neighbour who was also conducting the work. Fourteen farms were visited before the seed was sown and local conditions discussed. Twenty-three of the men visited the Experimental Station and examined the plots here, before seeding.

The majority of the farmers chose sod land on which they had failed to get a catch of clover the previous year. The hay crop was removed and from 10 to 15 tons of manure was plowed under with the sod. The land was then worked with more care and thoroughness than is usual on the average farm. Lime was recommended at the rate of 8 to 10 bbls. per acre, according to the amount of oyster-shell in the land. Where oyster-shell or lime had not been applied previously, 10 to 12 bbls. was recommended.

The seed was sown without a nurse crop, at the rate of 20 lbs. per acre. The majority of the plots were sown the last week in July and the first week in August, though some were sown early in June and a few as late as the last week of August. Soil laden with nodules, from an inoculated field at the Experiment Station, was sent, in lots of 25 lbs. for each investigator, to every locality where such inoculation could not be obtained locally.

The following general instructions were followed where practicable. A quarter acre of well drained land was chosen adjoining a main public road, the land to be in a fair state of fertility and as free from noxious weeds and grasses as possible. After hay-making this season it was difficult to get such weeds and grass killed at anything like a reasonable cost. The rain storms which came with unusual frequency

during the summer, did actually drown some of the young seedlings out after they were up several inches.

The following meteorological data will give some idea of the unusual weather conditions:

TEMPERATURES

July

	Max.	Min.	Mean	Precip.	Sunshine
1910	84.5	50	66.5	3.14 in.	278 hrs.
1911	87	52	68.9	1.42 "	292 "
1912	91.5	39	64.9	6.83 "	196 "

TEMPERATURES

August

	Max.	Min.	Mean	Precip.	Sunshine
1910	80	41	64.2	1.09 in.	256 hrs.
1911	87	45	66	3.36 "	253 "
1912	81	45	61.17	2.68 "	181 "

From the foregoing table it may be noted that during the two months of July and August, 1912, when the plots of alfalfa were being sown, there was more than twice as much rain as in the average of the two previous years, 162 hours less sunshine and a mean temperature during July of 2.8 degrees, and for August 4 degrees, below the average of the years mentioned. From this, we may say that 1912 was a very unfavourable season for the alfalfa seedlings. The seed sown in June withstood the unfavourable conditions that followed much better than that sown later. Many report that the plots sown in July were washed out of the ground unless protected by a nurse crop.

The following circular letter was sent on November 19th, 1912, to all the men who had undertaken to do the work. There were 19 of these in Prince county, 18 in Queens, and 26 in Kings county.

Dear Sir:—

Mr. F. C. Nunnick, Agriculturist of the Commission of Conservation, who furnished the alfalfa seed for the experiment which you are conducting, has asked me to report to him at once, on our success or failure on P. E. Island. Would you kindly fill in the required information on the attached circular and return to me?

Very truly yours,

J. A. CLARK

Superintendent

Notes on Alfalfa Sown, Season of 1912

Nov., 1912.

Name
Address
Did you get a good catch?
If you did not get a good catch, state whether the young plants were thick enough at first and died out, turned yellow, or how they acted.
.....
Did you inoculate with soil or culture?
Did you cut the alfalfa in August or September?
Is your patch weedy? If so, what are the weeds?.....
.....
Please state whether you expect it to winter or not, from present appearances
If you have no crop, state what you did with the seed. Was it sown? Or did it not grow?.....
.....
General remarks

Ten men state that they have been prevented from conducting the experiment this year, but would like to try next year. Their names are omitted from this report. Up to the present date, Dec. 30th, 1912, seven men have not replied to the circular letter. Each of these has a star placed opposite his name in the list of names which follows.

Farmers List of experimenters with alfalfa, who received 5 lbs.
Who Ex- of alfalfa seed from the Commission of Conservation in
perimented 1912:

NAME	ADDRESS	CATCH
1. Adams, Hugh.....	Springfield, Lot 8.....	Good
2. Beaton, M. R.....	Flat River.....	"
3. Brown, Adam.....	New Glasgow.....	Poor
4. Bryenton, Beecher.....	Brackley Point.....	Good
5. Cain, Wm.	New Perth.....	Poor
6. Campbell, Rod.....	Newport	Good
7. Campbell, H. A.....	"	"
8. Christian, W. D.....	Launching	"
9. Clark, Ray.....	Bay View	"
10. Clay, C. B.....	Bridgetown.....	"
11. Creed, Richard.....	Albion.....	"
12. Croken, M. H.....	Clermont.....	"
13. Crosby, W. W.....	Cornwall.....	"

	NAME	ADDRESS	CATCH
14.	Cullen, T. P.	Ch'town Royalty.....	Good
15.	Currie, Dan.	O'Leary.....	"
16.	Daly, A. P.	Iona.....	"
17.	Dawson, G. W.*	Cape Traverse.....	No report
18.	Deegan, W.*.....	" ".....	"
19.	Dewar, J. A.	New Perth.....	Good
20.	Edmonds, P. J. D.....	Summerville.....	"
21.	England, J. J.....	Springfield,, Lot 8.....	"
22.	Edwards Bros.*	Summerville.....	No report
23.	Gaudet, J. A.....	Iona.....	Good
24.	Hogan, W. H.....	Hope River.....	"
25.	Johnson, Edward.....	Harrington.....	"
26.	Jenkins, J. F.*.....	Summerville.....	No report
27.	Landrigan, Matthias.....	Sturgeon.....	Good
28.	Lowther, H. D.....	North Carleton.....	"
29.	Lowther, Leigh.....	" ".....	Fair
30.	Lyle Bros.....	Central, Lot 16.....	Good
31.	Moffatt, Artemas	New Glasgow.....	"
32.	Mooney, John.....	Iona.....	"
33.	Murchison, E. H.....	Cornwall.....	Fair
34.	McCormack, Dan. G.....	Launching.....	Good
35.	McGregor, W. H.....	Central, Lot 16.....	Poor
36.	McLean, A. E.....	South West, Lot 16.....	Good
37.	McLeod, Norman.....	Bridgetown.....	Fair
38.	McLean, Mortimer.....	New Perth.....	"
39.	McLaren, Stewart*.....	" ".....	No report
40.	McNaughton, Albert.....	Harrington.....	Poor
41.	McRae, Andrew.....	Ch'town Royalty.....	Fair
42.	Parkman, Albert.....	New Glasgow.....	Good
43.	Prowse, T. W.....	Brackley Point.....	"
44.	Rodd, Ira.....	North Milton.....	"
45.	Roper, James.....	Ch'town Royalty.....	"
46.	Ross, John R.....	Flat River.....	"
47.	Schurman, Albert.....	Central Bedeque.....	"
48.	Simpson, J. H.....	Bay View.....	Fair
49.	Stewart, Chas.*	Harrington....	No report
50.	Walker, Angus.....	St. Georges.....	Poor
51.	Wilson, Dan.*	Cardigan.....	No report
52.	Wigginton, T. J.....	Bridgetown.....	Good
53.	Wright, Alder.....	North Carleton.....	Poor

Under the heading "Catch" the words "good," "fair" or "poor" or the "star" indicate whether the seed came well, fairly well, very poorly, or whether no report was received.

**The
Results**

From the 45 reports received we gather the following data: 29 expect their plots to winter, 6 cut their plots in August or September, 42 state they used soil inoculation, 16 report that the young seedlings turned yellow during the season and 11 say that their plots have been choked by weeds or died, 31 state that their plots were weedy. Where old sod land was broken, it was impossible to destroy the natural grasses or couch grass during the wet weather of July, and, in many instances, these grasses took possession. The other weeds that have been troublesome were Lamb's Quarter, Yarrow, Pennycress, Nettles, Chick Weed, Spurry, Millet, Rib-grass, Canadian Thistle, Sow Thistle, Wild Buckwheat, Bindweed, Pig-weed or Smart-weed, Sorrel, Shepherd's Purse, Mustard, Lady's Thumb and May-weed.

From the above category it will be seen that the alfalfa has had many other plants to contend with. Once it is firmly established, however, its worst enemy in this Province is likely to be the natural grasses which are very persistent; unless the ground is thoroughly cleaned of them, the life of the alfalfa will be comparatively short.

The results, up to the present time, indicate a most hopeful future for this wonderful forage plant. Under many adverse circumstances, it has shown itself to be quite equal to red clover as a biennial crop and there is always not only the possibility, but the probability, that it will persist and supply the best of hay for a number of years.

The personal letters, which in many cases, accompanied the reports, indicate that the trial this year had caused many of our farmers to become quite interested over the possibilities of alfalfa growing here.

Many of the farmers felt that the alfalfa was not given a fair trial as it was impossible to prepare a seed bed after they received the seed. One of the main objects, however, in conducting this work this season, was to provide in almost every section of the Island, inoculated soil that will be available should others wish to grow this crop.

Quite a number of farmers in different parts of the Province purchased seed and tried alfalfa this season. Many of these obtained soil from the Experimental Station or from some field in their immediate neighbourhood. Quite a number of these fields were visited, and wherever inoculation was lacking, the plants were puny and yellow in appearance, in most cases disappearing altogether before autumn. Wherever inoculation had taken place, and the nodules were abundant, the crop was strong, dark green and in several instances, good crops of hay were saved.

(Sgd.) J. A. CLARK

New
Brunswick

In New Brunswick the work has been under the supervision of Mr. C. W. McDougall, Sussex, N.B. About seventy-five small lots of seed were placed with farmers in various parts of the Province. On account of the wet season, the work was considerably delayed. Mr. McDougall writes, in part, as follows:

"On the illustration farms at Corn Hill and St. Louis, plots were started. I know the one at Corn Hill grew well. Seeding conditions were terrible. When so much of the ground was so very wet, the best we could do was to get some seed sown on suitable small pieces of ground. I saw some very fine pieces of alfalfa last summer. Every year I am more strongly convinced that it is a crop that can be successfully grown in many places when our people understand its culture. I feel sure you will see how well its qualities fit right into a fundamental need of New Brunswick soil with reference to its fertility requirements.

From what I have heard and overheard of your plan of illustration farm work, I think it will be very acceptable and profitable to the farmers."

A more complete report will be available at a later date.

Nova
Scotia

The following is a copy of a letter* received from Mr. B. H. Landels of the College of Agriculture, Truro, Nova Scotia, regarding the work done in that Province:

I have your letter asking for report of work on alfalfa in this Province. I had delayed this report in order to combine with it reports from some experimental union work in alfalfa, which I had started with a few of our students and which had not come to hand.

I will summarize the report because, since this season has been so discouraging to the farmer, less care was given to the various plots than I had hoped and a detailed report would not have special value. Some farmers were even unable to overtake their work at all and so failed to put in the seed, while others did not sow as much as they had intended.

Following is the summary:

ANNAPOLIS COUNTY

Illustration farm at Clarence (two other farmers agreed to sow but failed to do so), tried here both in orchard and in open ground. In orchard, with vetch and clover as mixture, and alone. In open ground, both broadcast and in drills.

CUMBERLAND COUNTY

The crop was tried on six farms near Nappan, three on limestone formation with clay soil and three on rather sandy soil.

* Dated, Truro, N. S., Nov. 22, 1912.

Two farms at River Hebert with mixed loam soils were also used. On clay and mixed loam, crops suffered severely from wet season and made poor growth, many of the plants dying outright. On sandy soil, splendid results were obtained.

PICTOU COUNTY

Crops sowed on five farms near Durham and West River; soil a mixed loam, generally with gravel subsoil. Reported that plots are making good growth. Have been unable to visit them since sown.

COLCHESTER COUNTY

Three farms at Stewiacke; clay land generally, fairly well drained. Good growth was made on all three.

Owing to the fact that work began rather late in the season and that I did not attempt to force seed on land not prepared for it, work in Antigonish county was left over for another year. Late summer seeding was not attempted this year, except in one or two instances. Good growth was made on these plots but the winter will likely test them.

Reports sent out on experimental union work give varying results. The report from Annapolis county states that splendid growth was made. Pictou county reports good and Cumberland county fair results, though, in one instance, it is stated that only stray plants survived a cold, wet spell which came on after they were up two or three inches. Queens and Kings counties record good growth made. None make a report of extraordinary progress.

In all, seventeen farmers tried the crop in small plots, beside the Experimental Union members, before spoken of, and other independent experimenters.

In general, where the alfalfa was sown in orchards, only a fair stand was obtained in the shade, although where sown in the sun there was a good stand and a fair growth was made. With clover and vetch sown in the orchard with it, very few plants and poor growth is recorded.

On well-drained soil, good growth was made; in some places it grew two feet high, in others, the crop was clipped down twice to eight inches. On poorly drained soil, indifferent results were secured. The limestone region before spoken of happens to have a clay surface soil and therefore held too much water this season to allow the alfalfa to do well.

When sown with a nurse crop, the plants were weaker in every instance. Where it was sown in rows and cultivated, the growth was relatively the same on different types of soil, but was much more vigor-

ous than the adjoining broadcast sowing, except in one instance, the cause of which difference was not apparent.

Our own plots made fair growth, but they do not look as healthy this autumn as one could wish. Not so much difference as might be expected exists between the plants grown from seeds from different sources and of different strains. Grimm alfalfa has not given any exceptional account of itself either with us or in Experimental Union work this year, but yet it has not been exceptionally poor. Perhaps I had been expecting too much from this strain; at any rate, I find myself somewhat disappointed, though another year may completely alter the situation.

For next year's work, will it be possible to secure seed from some source where conditions are more nearly like our own? To my mind, the hardiest strain is a necessity if success is to be attained. Would be glad to hear from you on this point as well as to receive any suggestion relative to another season's work.

(Sgd.) B. H. LANDELS

ILLUSTRATION FARMS

Up to the present time thirty-one illustration farms have been established by the Commission of Conservation in the Dominion. These farms are situated in the districts where the agricultural survey has been conducted. The following is a list of the names of the illustration farmers and the districts where the farms are located:

PRINCE EDWARD ISLAND

J. M. McLean	New Perth	Kings county
Adam Brown	New Glasgow	Queens “
Albert Schurman	Central Bedeque	Prince “

NOVA SCOTIA

H. M. Tattrie	River John	Pictou county
Vernon B. Leonard	Cen. Clarence	Annapolis “
Taylor Bros.	Antigonish	Antigonish “

(J. G. Taylor, F. W. Taylor)

NEW BRUNSWICK

Chester Keith	Corn Hill	Kings county
Kenneth Raymond	Bloomfield Station	Parish of Norton
Shaw Bros.	Victoria	Carleton county

(S. A. Shaw, F. N. Shaw)

Fred Vautour	St. Louis	Kent “
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QUEBEC

John Chabot.....	St. Charles de Bellechasse.	Bellechasse county	
Adélarde Boily.....	Baie St. Paul.....	Charlevoix	“
Ludger Cormier.....	L'Assomption	L'Assomption	“
Richard S. Pringle....	Huntingdon.....	Huntingdon	“
L. R. Whitman.....	Knowlton.....	Brome	“
Thomas McDowell....	Shawville.....	Pontiac	“

ONTARIO

Whittaker Bros.....	Williamsburg	Dundas county	
(Conrad Whittaker)			
Wm. T. Hands	Perth.....	Lanark	“
Thos. Hall	Brooklin.....	Ontario	“
Geo. R. Barrie.....	Galt	Waterloo	“
Paul Snider.....	Elmira	Waterloo	“
A. M. Collver.....	Simcoe	Norfolk	“
Nelson Peterson.....	Ruthven.....	Essex	“
R. F. Taylor.....	Essex	Essex	“

MANITOBA

Chas. Penny.....	Hamiota
J. B. Lyons	Carberry
Jarvis Jickling.....	Morden

SASKATCHEWAN

W. D. Lang	Indian Head
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ALBERTA

G. H. Jaurnick	Stavely
Jas. A. Sutherland...	Namoo

BRITISH COLUMBIA.—Owing to the lack of extensive areas where mixed farming is carried on, the establishment of the illustration farms in British Columbia has been deferred until 1913. From the recommendations made by the collectors who conducted the survey work in 1912, it is expected that the selections will be made, and the establishment of the farms completed early in 1913.

The following is a copy of the memorandum of provisional agreement between the Illustration Farmer and the Commission:

Articles of
Agreement

MEMORANDUM OF PROVISIONAL AGREEMENT between

.....
of

of the first part, and James W. Robertson, of Ottawa, in the Province of Ontario, acting for the Committee on Lands of the Commission of Conservation, of the second part.

SECTION I

Whereas it is desirable to render some assistance to the farmers of.....by co-operating with them in investigating what may seem to be the most profitable system and methods of farming, by means of an illustration farm in their district.

SECTION II

Therefore,

(1). If
(hereinafter called the Illustration Farmer)

of
will agree to receive, from time to time, the Field Expert or Ex-
perts provided by the Commission of Conservation, and confer with
them concerning the system and methods to be followed on his farm
for investigation and illustration purposes;

(2). If the said Illustration Farmer will put into practice the system and methods which he and the Expert or Experts agree upon as being most suitable for his farm and locality, to the extent of his resources and so far as he is convinced that the returns will be profitable to him;

(3). If the said Illustration Farmer will allow the members of the association to meet from time to time (as shall be agreed upon between the Expert and himself) upon his farm for conference and discussion; and,

(4). If the said Illustration Farmer will agree to keep a simple register of occurrences on the farm for reference and assistance in the investigation and illustration work.

SECTION III

Then, James W. Robertson, of the second part, acting for the Committee on Lands of the Commission of Conservation, will agree:

(1). To provide an Expert Demonstrator who will meet the Illustration Farmer, of the first part, from time to time at the Illustration Farm for the purpose of investigating, discussing and helping to plan the system and methods for the farm operations.

(2). To assist the Illustration Farmer:

(a) To obtain the best quality and variety of seed grain;

(b) To provide an adequate supply of cover seed;

(c) To carry out after-harvest cultivation to suppress weeds, etc., all in order that the Illustration Farmer may more readily and successfully carry out the plans which he and the Expert Demonstrator have agreed upon as being likely to result in increasing his profits from the farm and in illustrating what may be done on other farms in the neighbourhood.

Agreed to on behalf of the Lands Committee of the Com-
At in the Province of
..... this day of
..... 19....

Agreed to on behalf of the Lands Committee of the Com-
mission of Conservation,
At in the Province of
..... this day of
..... 19....

LOCAL IMPROVEMENT ASSOCIATIONS

In districts where no farmers' club or kindred organization existed, Local Improvement Associations were organized among the farmers. The aims and objects of these associations are set forth in the constitution adopted by them, of which the following is a copy:

COMMISSION OF CONSERVATION

Illustration Farm and Neighbourhood Improvement Associations

EXPLANATORY

In 1910-11 some work of investigation was carried on in each of the Provinces by the Committee on Lands of the Commission of Conservation, in order to obtain information regarding the areas in various farm crops, the management of each farm in respect to crop rotation, seed selection, care, uses and production of manure, the keeping down of weeds, and the fuel, power and water supply. The information thus obtained is considered to be fairly representative of the agricultural conditions of our country. It is now proposed to join the farmers in conducting an improvement association and illustration farm in each

locality where the investigation is to be continued; the illustration farm to be owned and managed by an individual farmer in the locality.

The farmers who are learning, are learning much from their successful neighbours. That is how they learn. If such contacts could be brought about that more of them will learn, and all of them will learn more, a fine advance will be made towards the solution of many of their difficulties. The farmers will be invited to meet together for the purpose of getting useful information from each other and from the Experts of the Commission for the improvement of their farm management and practice. There has been among farmers too much separateness and want of cordial co-operation. These cannot be corrected by bulletins or by speeches. The way is to get the farmers to come together and do something for themselves and others, something definite, something they can see and understand—something that they can use for their own benefit. When each becomes a co-operating partner in the local improvement association for the good of the locality, all will grow strong in associated effort.

CONSTITUTION

ARTICLE I

Name and Motto

SECTION I.—This association shall be called “ The.....

 of
 The motto shall be

ARTICLE II

Aims and Objects of the Association

SECTION I.—To co-operate with the Committee on Lands and the Experts of the Commission of Conservation in the investigation of various rural problems; to promote the general advancement of rural industries in the neighbourhood; and to encourage the use of such means and methods as will improve the quality and the quantity of the products of the farm while maintaining or increasing the fertility of the soil, more particularly through the use of an illustration farm in the neighbourhood.

SECTION II.—To discuss ways and means whereby farming may be made more satisfactory by improving the surroundings and conveniences of the dwellings; by stimulating interest in the performance of farm operations in the most workmanlike and enjoyable way and by fostering a love for the study of nature.

SECTION III.—To consider and adopt means for the improvement of the social life of the community by having the people meet frequently to discuss questions that concern the whole community, and by encouraging co-operation and united action in directing and utilizing the local forces and agencies for these purposes.

ARTICLE III

Officers

SECTION I.—The officers of this association shall be a President, Vice-Presidents and a Secretary-Treasurer.

SECTION II.—The officers shall constitute the executive committee and it shall have general management of the business of the association.

Election of Officers

SECTION III.—The officers shall be elected at the first meeting called for the purpose of organization, and annually thereafter.

Duties of Officers

President

SECTION IV.—It shall be the duty of the President to preside at meetings; and to perform such other duties as pertain to his office.

Vice-Presidents

SECTION V.—It shall be the duty of a Vice-President to preside at meetings when the President is absent and to perform such other duties as pertain to his office.

Secretary-Treasurer

SECTION VI.—It shall be the duty of the Secretary-Treasurer to take minutes of all meetings of the association; to take charge of all money belonging to the association; to prepare and present, annually, or when called upon, a statement of the financial standing of the association; to give notice of meetings, and to perform such

other duties pertaining to his office as may be required of him by the association.

ARTICLE IV

Membership

Active Members

SECTION I.—Any farmer or other citizen residing in the vicinity of the illustration farm or where the meetings shall be held, may become a member of this association if he is interested in better farming and pays a membership fee of twenty-five cents annually.

Honorary Members

SECTION II.—Any person may become an honorary member by a unanimous vote at any regular meeting. He shall be entitled to all the privileges of an active member, except voting and holding office. He shall not be subject to any membership fee.

ARTICLE V

Meetings

SECTION I.—Meetings shall be held from time to time on the illustration farm, or elsewhere, at the discretion of the officers of the association and upon the request of the Field Expert of the Commission of Conservation.

Notice of Meetings

SECTION II.—The time and place of meeting will be made known before each meeting and members will assist in giving publicity.

Conduct of Meetings

SECTION III.—The usually accepted parliamentary rules and mode of procedure shall govern the conduct of the meetings of the association.

MEETINGS ADDRESSED

During the work of selecting the illustration farms and organizing the improvement associations, twenty-two meetings were addressed by F. C. Nunnick, the agriculturist of the Commission, and John Fixter, the travelling demonstrator. Five Farmers' Club meetings were attended and addressed by the Agriculturist. Mr. Fixter addressed several farmers' meetings during December.

The Agriculturist attended the Irrigation Convention held at Kelowna, B.C., in August, and also attended and delivered an address at the International Dry Farming Congress held at Lethbridge, Alta., in October.

DISCUSSION

DR. ROBERTSON: I find it quite unnecessary to make any extended observations on the report of Mr. Nunnick; but I think it desirable in presenting the report of the Committee on Lands to offer a word of explanation on some of the features of the Committee's work.

This Commission has to do with two big things in Canada, namely, material resources and human resources. The Committee on Public Health has to deal mostly with human resources. The Committees on Forests, Fisheries, Minerals and Water-powers have to deal chiefly with material resources. But the Committee on Lands, has to deal with both material resources and human resources. The Commission works through committees in order to give more particular attention to each department—to investigate subjects more carefully, and then to render better considered opinions with regard to the matter under investigation. That plan, I think, is essential.

Some Results Out of the work that we have done so far, have come a number of valuable results. But I want to indicate some other results which are, perhaps, not so obvious. We have had some results in improved administration by government authorities and other bodies, and we have had some results in improved regulations, notably for preventing destruction by forest fires. But we can only touch a very small part of Canadian activities with regard to resources, material or otherwise, by regulations, administration or legislation. Think how small a part of our daily and yearly activities are susceptible to influence from these sources.

Staff Too Small The Commission carries on investigations and obtains information but the main value to be derived from such information is in the interpretation put on it. However, the Commission has not a sufficiently large scientific staff to interpret its reports adequately. I say that advisedly and with full appreciation of the work done by the present staff. No one can give adequate consideration to the first results obtained by investigation if one has to attend to executive duties all the time. It has been well said that the man who has to consider any question requires leisure and opportunity to withdraw himself from the pressure of administrative duties. We

should have for every Committee not only one scientific expert, but two, three or four assistants, in order that the investigations conducted may have reasonable continuity until completed. It is all right to begin with one scientific man for each committee, but when an important work has been going on for two or three years, it becomes a somewhat serious matter should he sever his connection with the Commission. He may, after he has made a reputation, which I am glad to say our men are making, receive more favourable employment with some institution or corporation. We are in danger of losing good men now because we do not pay large enough salaries. If we should lose one expert, who has all these threads of investigation at his finger ends, the delay and set-back would mean a serious loss and one that it would be difficult to estimate.

The Commission has a large field and a competent staff is required with adequate support and provision for the training of younger men who would become familiar with the work. Then, if some drop out from illness, death, accidents or removals, we would have qualified men to take their places. It is essential that we should look at this matter not simply as a matter of present concern only. The long-distance view is what is required, and if we do not take the long-distance view in regard to our organization and administration, how can we expect the people throughout the country to take the long-distance view where weightier matters are involved? He that setteth not his own house in order, how can he contribute wisely to the guidance of others? It is necessary to have that in mind when the Commission's estimates are being prepared for presentation to Parliament. We would be blind to the interests of Canada unless we do our best to have an adequate staff organized.

I come to another consideration: how can the information obtained by investigation, and the considered opinions that come from our staff and others, be made effective? The Committee on Lands has taken one step. In actual farming operations legislation can accomplish almost nothing. Examine our statute books. How much legislation have we designed to suppress the growth and spread of weeds? There are weed laws in plenty, but they are constantly ignored or evaded, and consequently, they are of little practical value. They do not affect public opinion or regulate private action. Next my farm there may be a field filled with burdocks or some other noxious weed. I do not report it because the occupant is a good man and a good neighbour. All over the country you find that condition. We are becoming recognized throughout Europe as a nation that

Getting
Results

has dirtier fields than any other nation on the face of the earth. That is serious. If that is the reputation we are building for ourselves, in regard to agriculture, we are failing in one of the first elements of effective conservation. Permitting the wrong plant to grow and to take the plant food and the moisture and to occupy the area that should be held by desirable plants, is certainly not following good farming. In this we see how little legislation can do, how little regulations can accomplish, and how little administration from head-quarters can bring about. Where you are dealing with a large corporation, like a railway, where there are individuals in charge, you can pass a law and compel the railway to employ fire wardens and to put appliances on its locomotives to prevent fires. When a man is on a farm, you cannot legislate effectively that he shall get up in the morning, or stay up at night to kill weeds. You may say he must destroy the weeds or his neighbours will complain and prosecute. But the neighbour is a neighbour first and the weed inspector may be thinking more of political straws than of clean fields. When you cannot get at the individual by external compulsion, you may get everything done by willing co-operation.

Illustration Farms

In this connection let us consider the work done on the illustration farms. In carrying on the agricultural survey the Committee on Lands has made at least twelve hundred ardent friends. These are the twelve hundred men whose farms were surveyed during the last three years. There is not a man with a grudge, every man has a welcome for all we can show him. They have been encouraged to do something with us, not to get something from us. That is a line of agricultural development that needs to be followed in Canada. On that line we have had a good deal of success in regard to the illustration farms.

No Party Politics

On what basis were the farms chosen? There have been some remarkably frank remonstrances from certain individuals because they were not consulted about the illustration farms in their constituencies. If this Commission were running any political campaign for or against anybody, the men in active party politics would be consulted as to what friends should be chosen. But as the Commission of Conservation was not concerned about that, I want to make it quite clear that party politics were not considered. This Commission is not in party politics and need not be suspected of heading that way. The illustration farms are each within the limits of one of the groups of farms surveyed. Those farmers themselves whose farms had been surveyed were asked to come together

in a Neighbourhood Improvement Association; they, not the experts from Ottawa, but the thirty or forty men who live there, were asked which man in their neighbourhood, in his personality and his farm, could render them the best service as an illustration farmer. Conservatives and Liberals came together in this group and they had no political quarrels or differences in choosing the man and the farm they wanted. The object was to get a man with the best illustration farm for their purposes as farmers.

Popularizing Information The plan was to have a whole farm for illustration, not for experiment. One of these farms is like a light set on a hill. The owner of it has the support of this Commission, not in money but in expert counsel. He is not on salary and he does not receive any wages. As an independent farmer, he lets his neighbours see how well one man can manage a farm when his neighbours pool their knowledge with his and that of the experts from the Commission. That is illustration, not scientific experiment. It is an investigation into the social and economic situation to see how much better the illustration farmer, with expert counsel and neighbourhood co-operation, can do for himself and his locality. To get the expert counsel and the neighbourhood advice and co-operation applied to the farm and its business, is worth a good deal. This supplements the work of the experimental farms owned by the several governments. It does not compete with them. It opens new channels through which their influence reaches the bulk of the working farmers.

Neighbourhood Improvement I pass on to speak of the value of the neighbourhood improvement associations. I think we shall have neighbourhood improvement associations, not merely for the betterment of farming, but for every other line of rural activity. We must have better organized community effort. We do not get association for effort unless we have a definite purpose recognized by the units who are to organize. So the neighbourhood improvement association is designed to improve the farming in the neighbourhood. That is a definite object, which the people can understand. It is an object in the accomplishment of which they can each take part if they once get together and organize.

I need not tell you how gratified we, who are connected with the work, are with the unanimous, enthusiastic and continued support of the individual farmers to this neighbourhood improvement movement. It brings about the development of neighbourhood spirit for neighbourhood benefit, better farming, better business, better social life in every respect. The farmers unite their own knowledge with that of the

expert who goes to see them and who will go over the illustration farm with them twice a year. His duty is not to address meetings, but to go over the farm with the farmers and combine his knowledge and judgment with that of the farmers for the benefit of the community. The illustration farmer organizes that and puts it into practice on his farm as far as it is in accordance with his judgment of what is profitable. That is worth a great deal. The plan is being copied in several countries as a good means of getting the neighbourhood power made available and actually used in the neighbourhood problems, with the advantage of the knowledge and counsel from a central authority. We expect that next year the experts of the Commission will pay four visits to each illustration farm and arrange two meetings to go over the farms with each neighbourhood association. The neighbourhood improvement association is the best instrument to apply to the needs of a district whatever recommendation may come from headquarters.

May I, in conclusion, draw an illustration from an occurrence in my recent visit to England. I was walking home after dinner with three of the wisest men on education that I know, the heads of educational affairs in Scotland, London and South Africa, respectively. Dr. John Struthers spoke in this way: "While we have a very good Scotch Board of Education, of which I am secretary and administrative head, I have this very great pleasure and this very great satisfaction that I would rather have one thousand men as we have on the school boards all over Scotland, thinking and planning in their own way for the good of education in their several districts, than have a thousand men implicitly obeying me as the head of the Department." Similarly this Committee on Lands has twelve hundred farmers who are its unofficial members and it has thirty-one illustration farms, where the members of the neighbourhood improvement associations receive and give practical information which they could not get separately. If we have twelve hundred men each thinking and planning how he can do something on his farm to realize the best he has learned and how much good he can do to his neighbours by telling them what he has found out, we shall make real progress in the conservation of both material and human resources.

Agricultural Survey, 1912

BY

F. C. NUNNICK

Agriculturist, Commission of Conservation

DURING the summer of 1912 the Committee on Lands of the Commission of Conservation continued the agricultural survey work in the same districts as were surveyed in 1911. Two new districts were added in 1912, one in Inverness county in Cape Breton, N.S., and one in Compton county, Quebec. For figures giving the results of the survey in detail, see the tables beginning on page 17. For particulars describing the method of conducting the survey, see the report of work of the Committee on Lands.*

CROPS GROWN, CROP ROTATION, SEED SELECTION AND MANURES

Prince
Edward
Island

Regarding ordinary farm crops in Prince Edward Island, it may be said in general that mixed farming is followed by nearly all the farmers, but that not enough attention is paid to the hoed crop to give a sufficient amount of succulent feed for the stock in winter. The latter part of the season of 1912 was good for pasture, but since no provision was made for summer pastures, the pasturage was deficient right up to the end of the season.

Crop rotation enters into the programme of very few of the farmers. Occasionally some of the fields near the buildings are sown in roots, but the back fields are left in hay and pasture until they become mossy. Then they are broken with a crop of oats and re-seeded with timothy and a little clover. Two pounds of red clover, one pound of alsike and eight or nine pounds of timothy is the mixture generally used in seeding down. Systematic seed selection is not followed.

Very few farmers take good care of their barnyard manure, or use it to best advantage. It is often thickly applied to the small area planted to roots, while the fields further away receive none at all. Those who have farms on the seashore have access to the seaweed, which, if used as an absorbent in pig pens and cattle yards, adds greatly to the supply of manure.

*Fourth Annual Report of the Commission of Conservation.

Nova Scotia
and New
Brunswick

Much of what has been said of Prince Edward Island is also true about Nova Scotia and New Brunswick. The principal crop is hay, with oats as the chief grain crop. The area in hoe crop is small, except in districts where potato growing is specialized in. In the Annapolis valley in Nova Scotia, orcharding is the great specialty, and, as a result, other crops have to take a subordinate position. Systematic crop rotation is rarely to be found. The rotation generally used is grain followed by hay for from five to ten years.

Seed selection is practised by very few. Seed grain is purchased or exchanged by many, while some use seed grown on their own farms. There are too many varieties grown in most districts. In Carleton county, N.B., on thirty-nine farms there were thirteen varieties of oats being grown. Farmers buy seed of new varieties without knowing anything about the quality of straw, the per cent. of hull, the purity or the vitality. In this way, varieties are often introduced which are neither suitable nor profitable for the district.

The growing of clover does not receive the attention it deserves. The acreage sown to clover annually is too small and the amount of clover seed sown to the acre is not sufficient to insure a good catch. Some farmers are beginning to realize that it would pay them to cut their first clover crop early in order to save seed from the second crop. In fact, a number tried it this year.

In some cases, the manure receives some care, but most of the farmers do not pay enough attention to the prevention of waste, nor do they apply the manure so as to get the best results from its use.

Quebec

In Quebec, the principal crops are hay and grain, with very little hoed crops. In some places, tobacco is grown to a limited extent. Corn and roots could be successfully grown if sufficient attention were given to them; for, in many places, the soil lends itself well to the production of these crops.

One collector of information has the following to say regarding crop rotation: "Systematic rotation, except in the case of a few farmers, is entirely overlooked. The cause of this negligence is that nearly all the farmers ignore the importance of hoed crops." Another says: "Strictly speaking, there is not one farmer who has adopted a well-planned rotation of crops."

The selection of seed grain is such as to leave much to be desired in many districts. A systematic selection is seldom practised. Some farmers have fanning mills and make some use of them, but many have no mills and sow the grain just as it comes from the threshing machine.

In many districts, very little attention is given to the growing of clover. In nearly every instance, the amount of seed sown to the acre is too small to get good results. Owing to the lack of knowledge regarding it, and the want of proper clover hullers, no attention is given to the growing of seed. As a result of the efforts of the Commission of Conservation considerable interest is now being taken in seed production in the Shawville district in Pontiac county, and two hullers have been purchased by the farmers this year.

The manure is not valued as it should be. Very few farmers have roofs over their manure yards and few make provision for the retaining of the liquid manure. The common practice is to put the manure on the land intended for hoed crops.

In the older settled portions of Ontario, mixed farming Ontario is quite generally followed. Dairying is carried on to a large extent in the eastern counties, and also in the central and western parts of the province, in connection with other lines of mixed farming. In the extreme southwestern counties, corn, tobacco, early vegetables and fruit are specialized in. There is a greater diversification of crops in Ontario than in any other province east of British Columbia.

The majority of the farmers visited follow a more or less systematic rotation of crops; but often the whole farm is not included in the rotation, and the system is not as well planned as it should be. Convenience, labour scarcity and seasonal conditions regulate, to a large extent, the nature and length of the rotation. While considerable attention is paid to the seed grain, there is a lamentable lack of systematic selection, cleaning and grading. Every farmer visited makes use of the fanning mill, but many do not use it to best advantage.

On the whole, clover receives good attention. On the average, it was found that on every 100 acres of tillable land surveyed 15 acres were seeded to clover this year. The amount of seed sown per acre in most cases is only about half what it should be to produce best results. One man out of every three is growing alfalfa and very few report absolute failures. Not enough attention is being paid to the production of alfalfa seed, and farmers do not realize the importance of sowing seed grown under home conditions.

As a general rule, the manure is handled in a fairly satisfactory manner. There is, however, not enough attention paid to the prevention of loss. Some farmers allow too much of the manure to remain in the open yard during the summer. This is not applied to the land

until the fall, and much valuable material is thus lost by evaporation in the form of ammonia and by drainage in the form of liquid manure.

THE PRAIRIE PROVINCES

In the Prairie Provinces grain growing engages the attention of the farmers almost to the exclusion of everything else. Wheat is the most important of the grain crops, although oats, flax and barley are also important crops.

The following from the summary of one of the western collectors pretty well describes conditions regarding crop rotation:

“ In its truest significance there is no real rotation of crops. Practically all summerfallow and then take off two, or occasionally three, cereal crops; a portion of the last of which may be oats or barley. In this sense, all follow a more or less systematic ‘ rotation,’ but ‘ hoed crops,’ ‘ grass crops,’ and ‘ legumes ’ are almost entirely absent on all the farms. For wheat farming on a virgin soil, these men know and practise methods that in the past have given very large and profitable returns. The fallow conserves moisture, kills weeds and insures the succeeding crop against drought, but the ‘ rotation ’ does not keep up the humus supply, nor cope with the spread of weeds, nor add nitrogen to the soil. It merely provides a mighty lever to pry wheat from a willing soil.”

Manitoba In Manitoba, a distinct advance was noted everywhere in the matter of seed selection. Scarcely a farmer was found who did not grade his seed grain two or three times through the fanning mill, during the winter, so that it would not be neglected when the spring rush came. Field selection was practised by many and fully 25 per cent. of the farmers made provision for the next year’s seed, by getting some specially good seed and sowing it on either new breaking or a part of the summerfallow that had received extra attention. This year several farmers have sown a few bushels of Marquis wheat for next year’s seed, as they have found that it ripens a little earlier than Red Fife and the yield is fully as good.

Alberta and Saskatchewan In the provinces farther west, where settlement is newer, less attention is paid to seed selection, although even here greater care is given to providing good seed than is given in the East. The best grain is usually kept for seed and cleaned with the fanning mill.



OWNER GONE WEST

A familiar scene in the Maritime Provinces. This field was once cultivated, but, on being abandoned by its owner, has grown up to trees.



DRIFTING SOIL IN MANITOBA

As a result of continued grain cropping, the soil in many parts of the West has lost its supply of humus and drifts with the wind, covering up all vegetation in its path.



There is very little manure produced, only enough stock being kept (with a few exceptions) to provide milk and butter for the family and to do the work of the farm. There is great prodigality and wastefulness in the care and use of what manure there is. It is piled anywhere out of the way, or burned, and sometimes the buildings are moved away from the manure pile when it becomes large enough to be in the way.

British Columbia In British Columbia, farming is so diversified and large areas where mixed farming is carried on are so seldom met with, that any general remarks are liable to be misleading. It must be noted that in many cases the ultimate aim is to get the soil into condition to plant some kind of fruit trees at the earliest moment. Strictly orthodox orchardists do not practise inter-cropping, but the general custom is to grow some kind of hoe crop between the trees for the first few years. There is no regular rotation, each man doing what he thinks best under his own conditions. Very little attention is given to seed selection, except in the case of potatoes, and then it is practised by only the old growers, the new-comers planting anything that comes to hand. Considerable attention is paid to the growing of clovers for green manure; indeed, in some places where little stock is kept, this is the fertilizer relied upon. In parts where stable manure is made, very little care is taken to prevent waste.

WEEDS AND PLANT DISEASES

Maritime Provinces In the Maritime Provinces, it is all too evident that weeds are everywhere on the increase; and what the outcome will be is hard to predict. New weeds appear each year and the old established varieties continue to thrive. Many of the farmers do not consider weeds as enemies unless they are more numerous than the grain. The ox-eye daisy is especially abundant in many localities, the hay often containing more of this weed than timothy. Couch grass is a source of annoyance on the majority of the farms visited. No particular care is taken in the way of community effort to prevent the spread of the prevailing noxious weeds. A great many weeds at present giving considerable trouble to the farmers would be very little in evidence if a systematic rotation of crops were followed, and more hoe crop grown. Some of the annuals are giving considerable concern to the farmers of the Maritime Provinces, but are little thought of or seen in Ontario, where a more systematic rotation is followed.

A good many farmers complain of the ravages wrought by the potato beetle. Many state that they would plant more potatoes but for this foe. It is too often fought only in a half-hearted way. Some apply Paris Green and expect one application to completely exterminate the pest, while a large number still resort to hand-picking, which proves to be a very tedious operation and one that requires too much time.

Very few of the farmers treat their seed grain for smut. The majority of them do not realize the amount of loss sustained by them each year on account of its prevalence. Hence the general neglect in taking steps to prevent its ravages.

In Quebec, also, the weed problem is a serious one. In all of the districts visited couch grass, chicory, ox-eye daisy and many other weeds are found. In several districts visited, the paint brush is beginning to put in an appearance. One of the collectors says that the fence corners and roadsides seem to be left for the propagation of these special weeds and that, in order to keep the weeds out of the crop land, a shorter rotation is a necessity.

In Ontario, we find almost every known weed. The causes given for their spread on the various farms were: winds, unclean seed grain from the West, manure brought from town, hay purchased from other districts in time of shortage, flood waters and sheep carrying seeds in their wool. Farmers generally are too lax in the prevention of the seeding of bad seeds, and contaminated farms are the result. In Eastern Ontario, the perennial sow-thistle is spreading rapidly and causing the farmers much concern. This suggests the need of more hoe crops. In many parts of Ontario, the weeds are so numerous that space will not allow the mere enumeration of them. In the county of Norfolk, within three miles of the town of Simcoe, one of the collectors gathered sixty-five different kinds of weeds from one farm. This goes to show that something should be done to prevent the worst of these sixty-five different kinds from being allowed to go to seed and scatter over the neighbourhood. In Ontario and Quebec, very few of the farmers treat their seed grain for smut. Few realize the damage caused by this disease or preventive methods would no doubt be practised.

The collector in Manitoba has this to say about weeds: "The result of the dry season in 1910, when many of the weed seeds failed to germinate on the summerfallow, was more noticeable even this year than last. This and the fact that,

from seeding until the end of June, the present season was exceedingly dry, combined to give plenty of weeds a good start and weeds are fully 10 per cent. worse than last year, especially wild oats and Canada thistle. The latter, while not very troublesome so far, has made its appearance on a large number of farms for the first time and already seems to be quite at home; and, as a large number of farms are rented, a condition of affairs exists which may well cause an uneasiness to those who own their farms and want to see the district kept clean. Undoubtedly, weeds are most prevalent on rented farms.

“ In fact, the chief menace to Manitoba to-day is the man on the rented farm. Not all renters are careless farmers; a few are doing splendid work, but the majority are careless. They are working more land than their experience, their horses and their help and implements would seem to warrant if good results are to be expected. They keep very few stock, pay very little attention to manure, burn almost all of the straw, plant no bushes, shrubs or trees, allow fences and buildings to steadily deteriorate, and, worst of all, they allow weeds to take possession of the land. Their chief aim during the two or three years that they have the farm is to get all out of it they can and then move on to the defilement of another farm, regardless of the consequences to the land, to the neighbourhood or to the province.”

Regarding weeds in the other two prairie provinces, the following from the report of one of the collectors covers the ground quite well:

Alberta and
Saskatchewan “ The prevalence of weeds and the cost of controlling them is the most serious problem facing the majority of these men to-day. Wild oats are the worst. On many farms they leave little if any profit for the farmer. Thirty bushels dockage on a hundred-bushel load is an extreme case, but it will illustrate the point. Stinkweed is most prevalent, but is not the menace the wild oat is. Most of the other common weeds may be found, but in much smaller numbers. Canada thistle has gained a foothold and will be suppressed only by an intelligent, patient and persevering community effort. The weed problem is here in all its intensity to-day, and the fact that the people realize its cost to the community may lead—nay, is leading—they to plan for the introduction of a changed system. A few men are branching out into more diversified farming.”

The majority of the farmers in the Prairie Provinces treat their seed grain for smut, with the result that there is very little loss from this source.

British Columbia In British Columbia, the consensus of opinion is that the most of their bad weeds have been brought in from the Prairie Provinces or from the United States, in hay and grain. They have some weeds, however, for which the Prairie Provinces can scarcely be blamed. Canada thistle gives much trouble, and must be fought constantly if it is to be kept in check. On the roadsides in the Salmon Arm valley, there are miles of thistles without a break.

FUEL, POWER AND WATER SUPPLY

The following is what the collector in Prince Edward Island has to say about the fuel supply:

Prince Edward Island "The farm woodlot as a source of fuel supply is, in many cases, a thing of the past. Very few of the farms visited have any specific area definitely set aside for that purpose. Although most of the farmers who had no woodlot expressed their regret at not having any, not one of them had made any attempt toward reforestation or afforestation of the present waste places. They seem to think that the time when they would receive any revenue is too remote for them to be interested in farm forestry. Many of them seem to have inherited from their pioneer forefathers an enmity toward the forest, and chop away each winter with the sole hope of extermination."

The water supply on the farms visited might be improved. To find water on tap in the house or barn is a rare occurrence. When 12 per cent. of the wells are within 25 feet of the privy pit, it can scarcely be said that, from a sanitary standpoint, the water supply is above suspicion. This nearness to the source of contamination is positively dangerous, when it is considered that the soil of Prince Edward Island is of a very loose, open and porous nature.

Nova Scotia and New Brunswick On many of the farms in Nova Scotia and New Brunswick, there is to be found a good supply of fuel for an indefinite period. In some districts, however, farms are to be found side by side where the one has an abundance of forest trees, while, on the other, not even shade trees are left. There has been, and is, great waste of fuel, as, where the supply is great, only the best is



WOULD YOU LIKE TO DRINK IT ?

The water from this farm well is liable to contamination from the stagnant pool of manure water which drains down from the adjacent barnyard. The outlet of the pool is choked.



WEEDS AND MORE WEEDS

A public road in the Prairie Provinces. Weed-infested roads are a menace to the adjoining farms, and set a bad example for farmers.

being used, while the rest is left to waste or to make fuel for forest fires. No reforestation has been done. If what woodland is left is given proper care and the simplest principles of proper forest management are practised, the supply could be made to last indefinitely. In most instances, the water supply on the farms visited was good. In the districts along the river valleys, the supply is often obtained from springs in the hills. Quite a number of the farmers have water piped to the house and barn; but there are many others who have not these conveniences, but who could, with very little trouble, have a system installed, thus affording an excellent water supply for house and barn use.

Quebec In Quebec, the fuel is wood and coal, chiefly wood. In some districts, farmers have wood enough to last for all time, while in some other districts a number have no wood at all and state that, in their opinion, forest planting will soon have to be resorted to. Little, if any, of the land is really set apart for a permanent woodlot, and, where wood is to be found in abundance, waste is much more in evidence. In the matter of water supply, convenience is sometimes considered and very little thought given to the sanitary conditions surrounding the source of the supply. In Huntingdon county, fifteen of the twenty-five farmers visited had water on tap in the house; twelve farms had wind-mills and, in several cases, the well from which the water for house use and for the stock was obtained, was situated right in the middle of the cowyard.

Ontario In Ontario, with a few exceptions, the woodlots in the districts visited are small and scantily wooded. Practically no reforestation has been done, as land is generally considered more profitable when brought under crops, and the farmers burn coal when the wood supply is exhausted. The woodlots, in many instances, are permanent pastures, and remain such until the timber is taken off, when they are broken up and brought under cultivation. Many of the farmers eke out their small supply of wood by burning coal with the wood.

Water for house use is, in nearly every instance, obtained from wells. In some few instances it is taken from springs. The wells are too often poorly located, and there is much danger of contamination. In many cases the water has to be carried too far, thus necessitating much drudgery for the women on the farms. In some districts the rolling nature of the land makes sanitary water installations fairly easy. Where drive-wells are used, the supply of water is usually good. The

situation of the water-closets is very often far from ideal, and too many dug-wells are closer to these than is safe.

Prairie
Provinces In the Prairie Provinces, coal is used for fuel on most of the farms visited, except in two or three districts to the north, where some small timber and scrub land is to be found. Here, wood is sometimes used in summer and coal in the winter. Around Edmonton, soft coal is so plentiful that little difficulty is experienced in obtaining an abundance of this splendid fuel. Very little forest tree planting has been done, except around the buildings for use as shelter belts.

In Manitoba, in some districts visited, hard and soft water were found in many of the kitchens. While at first sight it would seem that wells under the kitchen and close to or in the stables would contain impure water, such is not the case; for these wells are drilled, sand-points are used and, the whole being carefully sealed up, the water is of a good quality. Very few cases of typhoid or other diseases have been caused by impure water.

In the other prairie provinces the water supply is obtained from wells, the most of which are drilled. In some cases the water supply comes from shallow dug-wells and is limited and often of poor quality. The deep drilled-well gives the best water. While the water supply is generally good, insufficient thought has been given to the relation of the water supply to possible sources of disease, such as water closets and outbuildings. In some cases the drainage from the latter is not away from, but toward the water supply. Very often the aim is to get water at any cost, and the question of possible contamination has, in some cases, been overlooked.

British
Columbia In British Columbia, the question of fuel supply is of little importance, because clearing is being done almost everywhere and fuel is abundant. The water supply is obtained from wells, streams and springs, about an equal number of each. As there are many excellent mountain streams, it is not difficult to obtain a supply of good water for house use if a little care is taken to have it piped or turned to the buildings. There are, however, instances where not enough care is taken to prevent contamination. It is pleasing to note that more than half of the farmers visited in British Columbia had water on tap in their houses. Circumstances are such, however, that many more could have the same conveniences if they would but take the trouble to install them.

LIVE STOCK, LABOUR AND MISCELLANEOUS

Prince Edward Island The class of live stock kept in Prince Edward Island is, on the whole, of little credit to the farms or the farmers. Changing conditions and the scarcity of labour seem to be accountable for a transition on many farms from dairying to beef-raising. There are, of course, some good dairy herds still to be seen, and some good draught horses are raised.

The labour problem is extremely acute on the Island. Good help grows scarcer each year, and it seems likely to do so for some time. The cities and the West have taken away thousands of young people, and now that the old folks left on the farms are, in many instances, getting beyond work, and no one remains to take over the reins of management, the pinch is beginning to be keenly felt. The farmers themselves have not done much in the past to stem the tide of young people leaving home. The latter are too often educated away from the farm. From a mere money making standpoint, some may have done well to leave the old farm, but, in the words of Goldsmith,

“ Ill fares the land to hastening ills a prey,
Where wealth accumulates and men decay.”

Farmers act independently. Co-operative associations come and go, but the labour problem still remains. It could be solved to some extent by a better planning of the work, more definite hours for labour, more conveniences around the buildings, the use of larger machines and the two-horse-and-one-man outfit in place of the two-men-and-one-horse equipments so much in evidence at the present time.

Nova Scotia and New Brunswick In Nova Scotia and New Brunswick, the live stock industry generally is about in keeping with other conditions on the farms. In Colchester county, N.S., there are some excellent dairy herds, but these are exceptions. There is, on the whole, too much lack of purpose or aim in the breeding operations and in the care and management of the live stock kept. One of the great drawbacks to the improvement of the herds is the too frequent use of the immature scrub bull.

The sheep industry is sadly neglected. This branch of farming could be made very profitable in the Maritime Provinces if the attention it deserves were given to it. Large areas of pasture land are available which are particularly suited to sheep raising.

The cry of labour scarcity is heard on all sides. Where hired men are given a house to live in and a small piece of land upon which to grow garden stuff, less difficulty is experienced in obtaining help. In

the Annapolis apple-growing district, where much help is needed at the rush season, the scarcity is hard to meet. Very few farm labourers from the Old Country come to this part of Canada, and, of those who do come, many are of so poor a class that farmers have become more or less hostile to this kind of help. Many of the farms visited show up very poorly for the amount of labour recorded as spent on them. Too much of the work is done spasmodically, and there is little evidence of regularity and method to be found in the field operations or elsewhere in the management of the farms.

Quebec In Quebec, dairying is specialized in to a large extent in many districts. The collector who visited the French-speaking farmers has the following to say about the live stock:

“ On some of the farms the stock gives one the impression that some careful breeding has been done. A few farmers make a practice of introducing new blood by buying or importing pure bred bulls every few years, and there is no doubt that this practice, accompanied by a judicious selection of the cows, is responsible for the improved herds on these farms. On the other hand, quite a number attach little or no importance to the breeding and selection of their stock. The result is that many are keeping a number of cows that do not give sufficient revenue to pay for their keep.”

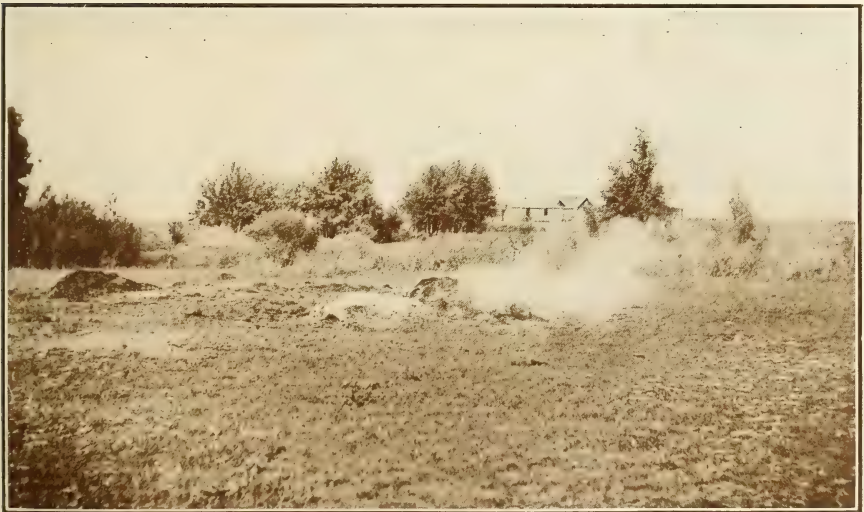
Very little attention is paid to cow-testing work, and where any attempt is being made to keep milk records it is often for just a few of the best animals.

The majority of the farmers report a scarcity of labour. This is more noticeable among the English-speaking farmers. The large families of the French-speaking farmers partially overcome this difficulty, but only partially; for even among these farmers the labour problem looms large. This labour shortage has lessened the number of dairy cattle kept on some farms and has also retarded the drainage of the land and other much-required farm improvements. On the small farms less is heard of shortage of help. In Ontario, Quebec, and particularly in the Eastern provinces, there are many farmers who are trying to work too much land. Many have taken over the next farm to their own, when their neighbour took the ‘ Western fever ’ and moved to the prairies. The result is that no part of the large farm is receiving proper care and attention, and the indications are that smaller, or home-sized, farms would be more profitable and would result in less dependence on paid outside help.



WASTING BARNYARD MANURE

Water from the roof washes out a large percentage of the fertilizing constituents of this manure pile.



BURNING MANURE IN SASKATCHEWAN

A western practice that will not increase posterity's regard for the present generation.

Ontario In Ontario, we find on the average more stock being kept per hundred acres than in any of the other provinces east of Manitoba. On the average farm, enough horses are kept to do the farm work and occasionally one or two are raised for sale. More than twice as many hogs are kept and sold annually per hundred acres in Ontario than in Quebec or any of the Maritime Provinces.

A great many of the farmers specialize in dairying, no less than 93 per cent. of those visited in Ontario being engaged in this work. The common practice is to have the cows freshen in the spring, causing the work of milking to come heaviest in the summer. Not enough attention is paid to winter dairying or to the production of succulent material for winter feeding. There is great need and room for more sheep on the average Ontario farm. Their weed destroying propensities alone will justify increasing their numbers.

The labour question is very acute in every district visited. The most satisfactory plan seems to be to hire a married man by the year and to provide him with a suitable house and some land upon which to grow vegetables for his table. In some districts, the small farm is helping to solve the problem. One of the collectors states that tile drainage will help to solve the labour question, as it will allow the land to be worked early in the season, thus causing the farm operations to be spread over a longer season. Many suggestions were offered by the farmers as to how best to overcome the difficulty. One man suggested that good business-like farmers from Canada should be sent to the Old Country to secure reliable men for work on Canadian farms. Another advocated the establishment of training farms for the teaching of men from Europe. Many realize that they would be better off and less dependent upon outside help if they planned their work so that there would be a seasonal distribution of the labour that is now available.

**Prairie
Provinces** Very few cattle, hogs or sheep are kept on the prairie farm, less than one cow per hundred acres being kept on the average on the farms visited in the West.

The following, taken from the report of the collector who visited the district around Indian Head, Saskatchewan, describes the situation aptly and is quite applicable to most of the districts visited:

“ This is not a ‘ live stock ’ district. Horses are kept because they are necessary to till the soil. A few cows are kept to supply milk and butter for the table, and hogs are kept only to replenish the family larder. A few men are feeding more hogs to supply

the increasing, and at times, profitable home market, and a few also are considering the possibilities of the milk trade in the nearby city of Regina. A considerable proportion raise their own horses, but many do not. Poultry as a source of revenue is kept by only a few, although each farm carries a considerable number to provide eggs and fowl for home use.

“ Labour is high priced and often inferior. The difficulty is greatest in the harvesting and threshing season—August and September. The harvest all comes on at once, and the importation of men is absolutely necessary to take care of the large crop that a few men, by means of modern machinery, are able to put in. The problem is not easy of solution. An altered system of farming would ameliorate the difficulty. The increase of population and consequent development of a home market will tend to encourage a more diversified agriculture, but it looks as though an outside market must be secured if even a proportion of our future population is to become prosperous by the production of live stock. Given a market and cheap transportation, we can solve the problem. Production of live stock will have its difficulties, but they are not insurmountable. We hope the marketing and transportation problems will not be found so.

“ The area covered in this township includes some of the best land in Western Canada. A portion of it has been farmed for thirty years. The value of summer-fallowing was first determined by accident in 1885 on some of this very land. The practice has been in vogue ever since and has made possible the utilization of millions of acres of semi-arid land in other portions of Western Canada. These old fields are producing large crops to-day where the cultivation is such as to keep the weeds in check. But even on this land evidences of deterioration are not difficult to see. Weeds come with the grain system, but may not lower soil fertility. That repeated cropping to cereals and constant cultivation and use of the fallow does, is evidenced by the ‘ drifting ’ of soil on summer-fallows before the rains of early summer (and after them). This is considered by some to be a serious menace on the heavier soils, the crop often being made a week or two weeks later by the ‘ stripping ’ of the loose soil from certain areas of land and its deposition on other areas, both of which suffer as a result. Humus or root fibre has decreased in the upper layer of soil, leaving it silty and ‘ shift,’ less retentive of moisture and more cold and soggy than before. In spite of these conditions, enormous, almost

unbelievable, yields are occasionally secured, but only occasionally, in recent years.

“The spread of weeds, the drifting of soil, the high cost of production (machinery, labour, interest, added cost of fighting weeds)—these are the problems of production now before the farmers in 18—12 W. 2nd.”

British
Columbia

It is doubtful if there is anywhere in the world more suitable conditions for the breeding and feeding of live stock than are to be found in the interior of British Columbia. Cattle ranching is made easy by the dry bracing climate and nutritious grasses. In spite of this, the supply is not keeping pace with the demand caused by the increasing population. There are thousands of acres of land suitable to sheep breeding and nothing else, and which should be turned to profitable account in this way. Dairy-ing, too, needs encouragement. Poultry is not receiving sufficient attention, although there are scores of orchardists with the popular ten-acre fruit farm who could very profitably keep a large flock between the trees.

The help problem is a very aggravated one in British Columbia. Regarding this, the collector for the interior of the Province says:

“But it is not merely men of the right stamp who are required here, but married men with boys and girls who can lend a hand in the garden in the evening, or can pick fruit during the holidays—boys who can do a boy’s work, girls who can do a girl’s work—who can help a tired mother with her sick baby, or enjoy the gambol of the little ones rolling on the grass, or, if need be, in the dust or mud, meanwhile themselves growing up into grooms and gardeners, domestic helps and nurses, and, of course, matrimony.

“If the authorities would but turn their attention to the immigration of this class, the labour problem of the Province would be in a fair way to being solved. But until this is done, there will be the sorry spectacle of crowds of men walking the streets of Vancouver, vainly seeking ‘positions,’ while agricultural land is being starved for labour, but labour of a very different sort.

“There is no finer peasantry in the world than the rural peasantry of England, France and Belgium. They have the instincts of the soil; the ways of the town are not their ways. They will work for an employer all day, and cultivate their own gardens in the evening. They marry early and bring up sturdy

families. It is from this class that the Army, the Navy, the Post Office and Railway Services are recruited, and it is from this class that the labour necessary to develop the natural resources of the Province should be drawn."

Here is what one large employer of labour says: "Either bring in the right kind of white help or take the poll tax off the Chinese and increase their numbers." Another says: "Employ Orientals." Others are calling for immigrants with families, while some suggest institutions to train young men for ranch life.

Agricultural Survey Statistics, 1912

I. AREAS

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
No. of farms.....	150	94	94	247	300	86	33	100	158
Acreage surveyed.....	28,185	11,415	16,579	45,928	40,085	40,530	16,565	40,000	114,617
Av'g size of farm.....	188	121	176	186	134	471	502	400	725
Tillable acreage.....	9,634	8,573	8,798	27,588	30,907	33,819	15,895	38,907	50,680
Per cent tillable.....	34	75	53	60	77	83	95	97	45
Untillable (acres).....	5,339	1,179	1,542	7,510	4,087	3,439	767	822	36,585
Per cent untillable.....	19	10	10	16	11	9	4	2	32
Acreage in crops.....	9,366	8,495	8,805	27,217	29,784	27,189	10,405	23,897	23,202
Per cent in crops.....	34	75	53	59	75	67	63	60	20
Grain (acres).....	1,407	2,506	1,612	5,865	11,840	23,967	9,701	19,430	4,779
Per cent in grain.....	5	22	10	13	30	59	58	49	4
Hoe crop (acres).....	473	553	311	1,123	4,113	316	415	129	3,331
Per cent in hoe crops..	2	5	2	2	10	8	3	3	3
Hay and pasture (acres)	7,486	5,436	6,804	20,229	13,831	2,906	289	4,338	15,092
Per cent hay and pasture	27	48	41	44	35	7	2	11	13
Woods (acres).....	13,283	1,592	6,239	11,861	3,961	2,595	330	1,738	19,448
Per cent in woods.....	47	14	37	25	10	6	2	4	17
Summer-fallow (acres).	34	71	15	39	853	6,405	4,422	4,153	888
Per cent in sum.-fallow.	.01	.6	.009	.08	2	16	27	10	.7

II. ROTATION OF CROPS

(Figures given as percentages)

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Systematic rotation....	11	35	39	11	66	76	88	71	10
Rotation on part of farm	14	.....	.....	.....	.....	.....	.....	.....	7
No rotation.....	75	65	61	89	34	24	12	29	83

III. SELECTION OF SEED

(Figures given in percentages)

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Using seed grain from own farm.....	53	90	81	87	87	93	100	79	37
Using part of seed grain from own farm.....	1	5	1	2	5	.....	.....	3	3
Systematically selecting seed.....	2	.....	2	.4	2	24	.....	5	3
Keeping best part of field for seed.....	40	23	69	88	56	85	91	62	34
Cleaning seed grain.....	62	99	79	92	100	85	99	94	38
Cleaning seed grain with fanning mill.....	25	99	83	89	100	86	99	98	37
Cleaning seed grain by other means.....	Wind, 19	..	Wind, 2	Flour M., 2	.....	.....	.....	.....	.....
Treating seed grain for smut	7	23	1	1	14	96	91	92	39

IV. PRODUCTION OF TIMOTHY AND CLOVER SEED

(Figures given as percentages)

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Saving own timothy seed	31	73	45	44	41	.....	.....	21	2
Saving own clover seed.	1	2	2	14	40	.....	.....	.....	1

V. CLOVER AND ALFALFA

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Acreage seeded to clover	690	1,285	835	3,134	4,745	.....	.....	.....	1,545
Per cent of grain sown seeded to clover	49	51	52	53	40	.....	.....	.....	32
Av'g lbs. per acre sown of red clover	5	2.5	4	4	6	.....	.....	7	9
Av'g lbs. per acre sown of alsike..	3	1	3	4	1	.....	.....	.....	4
Av'g lbs. per acre sown of timothy	10	8	7	8	5	8	.....	6	6
Per cent growing alfalfa	7	13	3	10	33	5	3	15	33
Acreage of alfalfa grown.....	6	5	1½	24	374	36	10	16	699
Per cent of total crops in alfalfa ...	.06	.6	.02	.03	1	.1	.1	.04	4
Per cent of failures in growing alfalfa .....	.....	.5	.....	1	3	1	.....	25	3

VI. COMPARISON OF YIELD OF CROPS NOW WITH TEN AND TWENTY YEARS AGO (Figures given as percentages)

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
WITH 10 YEARS AGO:									
Reporting increased yield.....	48	20	46	72	38	2	6	.....	44
Average per cent of increase...	24	14	19	19	18	10	15	.....	26
Reporting decreased yield	10	32	21	6	8	56	42	16	2
Average per cent of decrease...	15	14	12	10	17	12	7	25	16
WITH 20 YEARS AGO:									
Reporting increased yield.....	29	14	28	35	22	.....	6	.....	7
Average per cent of increase...	27	19	18	33	22	.....	15	.....	26
Reporting decreased yield	11	36	20	4	6	9	3	1	.6
Average per cent of decrease...	17	20	18	13	23	24	12	15	10

VII. NAMES OF VARIETIES (Figures given as percentages)

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Knowing names of varieties of grain sown.....	74	90	44	49	62	80	100	85	26
Knowing part of names.....	19	8	23	23	24	1	.....	14	13
Not knowing any of names.....	7	2	33	28	14	19	.....	.....	30

VIII. MANURE (Figures given as percentages)

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Using farm manure.....	100	100	99	100	100	94	79	79	96
Using chemical fertilizer	83	34	67	32	6	.....	.....	.....	89
No care to prevent waste.....	48	46	61	86	77	100	100	100	93
Having manure shed.....	25	50	29	7	12	.....	.....	.....	4
Having manure cellar.....	22	.2	11	3	.7	.....	.....	.....	1

IX. DISPOSAL OF HAY AND GRAIN CROPS

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Tons of hay sold per farm	6	1	13	12	2	.....	.....	19	33
Tons of hay fed per farm	41	all	32	47	30	9	9	21	76
Bus. of grain sold per farm.....	17	120	86	83	180	938	5,721	3,838	2,058
Bus. of grain fed per farm	243	.....	361	584	762	389	2,022	1,591	1,229
Per cent burning the straw.....	.....	.....	1	.....	.....	73	99	55	.....
Per cent using straw for feed and bedding	100	100	97	99	100	80	85	47	63
Per cent selling straw.....	.....	.....	2	1	.....	.....	.....	.....	1

X. DISPOSAL OF ROOT CROPS

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Av'g bus. potatoes sold per farm..	65	260	253	53	49	4	27	114	663
Av'g bus. other roots sold per farm.....	58	27	2	3	65	.....	.....	3	45
Av'g bus. roots fed per farm	567	84	416	353	826	137	42	22	395

XI. LIVE STOCK

(Figures given as average number per 100 acres)

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Cows.....	4	6	4	6	6	.8	.5	1	1
Other cattle	6	7	4	7	15	3	.6	2	42
Horses.....	1	2	1	2	3	2	2	2	1
Colts.....	.5	1	.5	.8	1	.5	.3	1	4
Sheep.....	6	6	2	5	4	.4	.09	1	5
Brood sows.....	.4	1	.4	.8	2	.4	.5	1	2
Swine fattened annually	3	9	3	5	20	4	2	7	16
Chickens	16	39	28	27	63	23	17	34	25

XII. BRANCHES SPECIALIZED IN

(Figures given as percentages)

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Specializing in mixed farming...	77	77	45	46	58	34	3	52	20
Specializing in dairying.....	11	17	41	38	93	.....	.....	.....	25
Specializing in grain.....	.....	.....	1	.5	1	36	97	25	.....

XIII. FARM LABOUR

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
No. in family.....	5	3	5	6	5	4	3	4	4
No. over 14 years of age.....	3	1	3	4	3	2	2	3	2
No. days labour spent per 100 ac. by men.....	190	320	153	267	341	95	76	103	456
No. days labour spent per 100 ac. by women.....	203	235	152	236	355	68	85	100	412
No. days labour spent per 100 ac. by boys.....	16	25	31	13	12	.....	2	2	76
No. days labour spent per 100 ac. by girls.....	16	16	20	10	6	.....	.....	2	22
No. days labour paid outside help	66	121	54	90	42	93	136	66	1,208
Total no. of days labour spent per 100 ac. in year.....	453	704	408	570	852	252	301	264	2,823
P. c. reporting scarcity of labour.	53	80	76	84	77	27	70	29	71
P. c. reporting scarcity of men...	53	75	65	81	69	9	70	23	62
P.c. reporting scarcity of domestic	25	7	33	13	22	17	6	19	7

XIV. FUEL SUPPLY

(Figures given as percentages)

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Using wood.....	90	95	100	90	57	29	12	1	91
Using coal.....	2	40	.....	1	3	19	48	72	.....
Using coal and wood.....	7	29	.....	9	37	51	36	27	9
Using gas.....	.....	.....	.....	.....	2	.....	.....	.....	.....
Av'g no. of years wood supply will last on farms having wood lots.....	57	27	73	66	22	10	11	9	27
Having indefinite supply.....	53	28	42	52	37	77	21	16	65
Having definite wood area set aside.....	55	27	64	70	60	10	6	23	3
Having done planting.....	1	.....	.....	2	1	29	52	36	1
Av'g no. of trees planted.....	500	.....	.....	25	4 ac.	1,257	3,022	1,220	85
Successful in planting.....	100	.....	.....	100	100	68	99	47	90
Failing in planting.....	.....	.....	.....	.....	.....	5	.....	35	.....

XV. WATER SUPPLY FOR THE HOUSE

(Figures given as percentages)

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Obtaining water for house from wells	59	98	61	46	95	98	88	80	18
Obtaining water for house from springs	30	.....	36	38	1	.....	3	.....	21
Obtaining water for house from streams	9	2	1	10	.....	.....	.....	7	20
Obtaining water for house from rain water	1	.....	1	1	5	.....	.....	1	.....
Having source of water supply: within 10 ft. of or at or in buildings	5	37	10	2	25	27	.....	2	1
over 10 ft. and up to 25	5	32	11	3	39	15	6	4	2
over 25 ft. and up to 50	19	17	9	13	15	7	6	23	4
over 50 ft. and up to 100	12	9	19	8	19	27	12	32	6
over 100 ft. and up to 200	16	1	5	13	5	10	18	10	6
over 200 ft. and up to 300	7	.....	5	2	1	1	9	1	9
over 300 ft. and up to 500	11	.....	15	4	.....	5	12	2	7
over 500 ft.	13	.....	24	13	.....	.....	27	4	28

XVI. DISTANCE OF SOURCE OF SUPPLY FROM BUILDINGS OR OTHER SOURCES OF CONTAMINATION

(Figures given as percentages)

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Having w.c. within 25 ft. of house water supply .....	.....	12	3	3	2	1	.....	.....	1
Having w.c. over 25 up to 50 ft.	14	14	3	10	14	3	3	3	4
Having w.c. over 50 up to 100 ft.	15	22	19	13	38	47	15	20	8
Having w.c. over 100 ft.	53	32	46	25	28	40	67	45	37
Disposing of sewage in pit under privy	31	70	82	47	39	87	97	.....	33
Obtaining water for stock from well	35	82	44	38	91	91	76	93	9
Obtaining water for stock from spring or stream	51	18	37	49	11	.....	.....	2	33
Obtaining water for stock from pond or other source	2	.....	16	5	1	.....	21	3	16
Source within 10 ft. of or in bldgs.	1	27	11	3	11	9	.....	1	.....
over 10 and up to 25	4	26	2	6	11	5	9	4	1
over 25 and up to 50	15	18	3	12	18	21	6	21	3
over 50 and up to 100	9	12	10	10	17	20	9	30	8
over 100 and up to 200	12	5	14	10	9	23	21	15	5
over 200 and up to 500	20	4	23	16	3	3	24	3	16
over 500	27	2	29	21	.5	.....	15	1	19

XVII. METHODS OF CONVEYING WATER TO HOUSE

(Figures given as percentages)

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
By hand	62	85	66	44	79	72	76	80	1
Drawing or hauling by horses ...	3	.....	.....	1	.....	.....	15	16	16
Having water on tap in house....	28	3	16	40	21	12	.....	4	57
Having bath and w.c. in house..	4	2	5	17	8	9	6	3	49

XVIII. POWER ON FARMS

(Figures given as percentages)

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Using horse power on farm	100	100	100	100	100	100	100	100	100
Using other than horse power on farm	13	52	6	19	63	35	45	42	28
Using horse, engine or windmill for house and barn work .....	.....	9	2	1	4	5	45	11	11
Having windmill	4	2	.....	13	40	30	70	26	8

Game Protection, North Shore

THE CHAIRMAN: I understand that Mr. Patton has been asked to place a certain matter before you for your consideration.

MR. PATTON: I have been requested to place before you a proposition made by Lieut.-Col. William Wood of Quebec. Col. Wood proposes that the Commission spend \$30,000 in the next five years in the protection of wild life along the north shore of the gulf of St. Lawrence.

THE CHAIRMAN: How much ?

MR. PATTON: Thirty thousand dollars.

This territory is a wild bleak strip of coast line which comes within the jurisdiction of the Province of Quebec. The character of it is best described by Col. Wood himself in the pamphlet which he placed in your hands yesterday:

“ There is no stranger country anywhere than this Canadian Labrador. Dr. Grenfell's Labrador, which has nothing to do with Canada, is known to everyone. But the very existence of our own Labrador, with its 200 miles of coastline and its more than 20,000 islands, is quite unknown, as a separate entity, to all but a very few outside of its little, but increasing, population of 1,200 souls. It lies on the north shore of the Gulf, just inside the strait of Belle Isle, and runs from Bradore in the east to Kegashka in the west. Here, close beside the crowded track of ocean liners, and well below the latitude of London, is by far the most southerly arctic region in the world. It is a land of rock and moss; for, except along the river valleys, there are neither grass nor trees. No crops are grown or ever can be grown. There are no horses, cattle, poultry, pigs or sheep. Reindeer are said to be coming, but there are none at present. The only domestic animals are dogs, that howl like wolves, but never bark. And yet it is a country which is rich, and might be richer still, in fish and fur, and which seems formed by Nature to be a perfect paradise of all that is most desirable in the wild life of the north, especially in the seabirds that are now being done to death among its countless archipelagoes.”

He refers particularly to the protection of birds and their eggs. It seems that Newfoundlanders and others, in cruising along these coasts in their fishing vessels, land and wantonly destroy large numbers of birds and their eggs, thus preventing propagation.

The kind of protection that Col. Wood wishes the Commission to afford is a motor boat patrol along about 200 miles of coastline extending from Kegashka to Bradore. He puts it succinctly on page 21 of his pamphlet when he says:

“ I beg to propose that the Commission should bring the Canadian Labrador under conservation by protecting bird life on the coast for a term of five years, as an experimental investigation, and by examining, for one year, the whole question of the birds and mammals, inland as well as on the seaboard, and in winter as well as summer. The cost of the first would be \$5,000 a year for five

years = \$25,000. The cost of the second would be \$5,000 for one year only. The total cost would be \$30,000."

That, in brief form, is the proposition which Col. Wood wishes you to consider.

DR. ROBERTSON: I beg to move that this proposition be submitted to the Executive Committee, and while I do not desire to offer any obstruction, personally, I feel like urging that it be commended to the Executive Committee. Col. Wood has done a great deal of work of undoubted value. Yesterday we had presented to us the desirability of protecting wild life on part of the Rocky Mountains Forest Reserve. I would favour it for the whole reserve. A good many men who heard Col. Wood when he addressed the Canadian Club in Ottawa recently felt that the work he has done is of immense value to Canada. In Col. Wood's pamphlet you will find a personal letter from the Governor General commending this to the Commission. We do not often get a letter of this kind because the Governor General does not often interfere in Canadian affairs. He has done so in this case, because, even from an empire point of view, it is desirable to preserve the life of birds. I beg to move that the matter be referred to the Executive Committee for such action as it may see fit to take.

The motion was seconded by Mr. C. A. McCool and adopted.

REPORTS OF COMMITTEES—RESOLUTIONS

THE CHAIRMAN: We shall now have the reports of Committees. First, I shall call upon Hon. O. T. Daniels for the report of the Committee on Minerals.

COMMITTEE ON MINERALS

Chairman-
ship of
Committee

MR. DANIELS: Your Committee reports as follows:
WHEREAS the chairmanship of the Committee on Minerals is vacant; and,

WHEREAS it is expedient that such vacancy be filled by a person intimately acquainted with mining affairs;

IT IS RESOLVED that such appointment be filled as soon as possible.

Previous Re-
commenda-
tions

WHEREAS certain recommendations have been made by the Mining Engineer of the Commission in the following reports: Minerals, 1911; Annual Report, 1912; and in the summary of work done in 1912 and presented to this meeting, and as there is need that these recommendations be placed before the

proper authorities in order that further action may be taken in the matter;

IT IS RESOLVED that, as soon as the chairman is appointed, there be called a special meeting of the Committee on Minerals to consider this question.

DISCUSSION

MR. DANIELS said: In respect to the first resolution of this report, if we desire the appointment of a man outside of the Commission to be chairman of this particular Committee, the proceeding seems to be that he must first be appointed a member of the Commission by order in council, and, therefore, as far as we can go in respect to this matter now is to recommend that such a person be appointed.

In referring to the second resolution of the report, I may say that for a long time there has been no chairman of this Committee. The result has been that there has been no meeting of the Committee, and the work, though performed in a thoroughly efficient manner, has been done more by the direction of your esteemed Secretary and Mr. Dick, your Mining Engineer, and they both desire that there should be more co-operation on the part of the Committee than there has been heretofore.

On motion of Hon. O. T. Daniels, seconded by Hon. J. A. Mathieson, the report was adopted.

COMMITTEE ON LANDS

DR. ROBERTSON: I desire to present the report of the Committee on Lands. The Committee, after discussion and consideration, adopted the following resolutions:

(1) Moved by Dr. George Bryce, seconded by Dr. W. J. Rutherford,—

THAT the agricultural survey work be continued on about the same scale and carried out this year in new districts; and,

THAT the Committee co-operate with the provincial departments of agriculture in the selection of the areas to be surveyed.

(2) Moved by Dr. Rutherford and seconded by Dr. Jones,—

THAT, in view of the widespread growth of alfalfa in at least small plots, the alfalfa investigation work be not carried any further, with the exception of the work in Quebec which should be carried on one year more in order to complete the previous arrangements made in regard to the work in that Province.

(3) Moved by Dr. C. C. Jones and seconded by Dr. W. J. Rutherford,—

THAT the Committee's work in connection with the illustration farms be continued for a period not less than that required to obtain the results from successive crops during three years.

The Committee respectfully reports these resolutions and recommends the approval of them by the Commission.

The resolutions were adopted.

COMMITTEE ON PUBLIC HEALTH

DR. C. A. HODGETTS: On behalf of the Committee on Public Health, I beg to submit the following report for your approval:—

Your Committee on Public Health begs leave to report and recommend as follows:

A National Congress Your Committee, having considered the recommendations of its medical adviser and the numerous signed petition from some of the provincial governments of Canada and many municipal authorities, as well as from public organizations and private citizens, in reference to the calling of a National Congress on Housing and Town Planning, would recommend that this Commission prefer the request to the Honourable, the Prime Minister of Canada, that the Government secure the services of Mr. Thomas Adams, officer of the Local Government Board of Great Britain, with a view to his attendance at the Congress and his subsequently visiting the principal cities of Canada under the auspices of the Commission of Conservation to speak upon the housing problem; and, with a view to the furtherance of this scheme, it is recommended that, should the application to the British Government for the services of Mr. Adams be favourably considered, there should be appointed to act in conjunction with this Committee on Public Health and the Medical Adviser to carry out such a scheme, the following committee, with power to add to its numbers:

Ontario:

Sir John Gibson, Lieutenant-Governor of Ontario

Mayor James Ellis, Ottawa

Professor E. J. Kylie, Toronto

Mr. H. M. Frost, Hamilton

Mr. G. Frank Beer, Toronto

Quebec:

Sir George Garneau, Quebec

Dr. E. P. Lachapelle, Montreal

Mr. W. D. Lighthall, K.C., Montreal

New Brunswick:

T. H. Estabrooks, Fredericton

Nova Scotia:

To be selected

Saskatchewan:

Professor Murray, Saskatoon

Alberta:

Senator Lougheed, Calgary

British Columbia:

Mr. Henry B. Thomson, Victoria

Manitoba:

To be selected.

In case the services of an officer of the Local Government Board of Great Britain can not be secured, your Committee would recommend that the National Congress be called at Ottawa at as early a date as possible, for the discussion of the subjects of housing and town planning, the details to be subsequently arranged by the executive officers.

National Laboratories Your Committee recommend in reference to the recommendation made last year regarding the establishment of national laboratories for the carrying on of experimental research and for manufacturing purposes and for which the government voted an initial grant, that this work should be proceeded with at an early date, and for this purpose would recommend that the Government appoint a laboratory expert with medical qualifications to initiate and subsequently carry on this important branch of public health work.

Vital Statistics This Committee would further recommend that the attention of the Federal Government be drawn to the necessity which exists for the systematic reporting and collection of vital statistics, and, to this end, would suggest to the Government of Canada that, in so far far as practicable, a national system of compiling vital statistics be adopted, and that the various provinces be requested to comply therewith, so as to permit of the collection and publication of these national statistics.

Food Supply Your Committee would recommend that the Medical Adviser carry on an enquiry into the methods adopted in the various provinces and municipalities of Canada, with a view to the better protection of the food supply of the country.

All of which is respectfully submitted.

The report was adopted.

SIR EDMUND OSLER: The Secretary should write a letter to the Hon. Mr. Borden, placing this request before him. I have seen him with regard to the matter and he is thoroughly in accord with having Mr. Adams invited here. It would be well to mention the date, because I understand there would be no use in asking him to come in July and August.

COMMITTEE ON FORESTS

MR. SNOWBALL: The Committee on Forests submits the following report:

It is recommended:

Fire Protection (1) That the Commission approve the principle of co-operation between the Board of Railway Commissioners and the fire protective organizations of the Dominion Government and provincial governments in the administration and enforcement of the fire regulations of the Board of Railway Commissioners, along the lines now in effect in the West and as proposed in the East.

(2) That representations be made to the Dominion Government looking toward the establishment of a fire-protective service along the Intercolonial and National Transcontinental railways similar to that provided for in Order 16,570 of the Board of Railway Commissioners.

(3) That the governments of New Brunswick and Nova Scotia be urged to organize separate branches devoted especially to forest fire work, including all lines of railway fire inspection, as well as the handling of fire ranging throughout the Provinces at large; also to take over control definitely with regard to fire protection along provincially chartered railways, through the enforcement of existing legislation or the enactment of new legislation where necessary.

Brush Disposal (4) That the Commission urge the Dominion Government and all provincial governments not now doing so, to consider carefully the question of brush disposal in connection with all new licenses and renewals of old licenses issued in the future. Especial care in this connection is needed to safeguard the country along railways and waggon roads. Especially in Ontario, New Brunswick, Nova Scotia and in the Timber Branch of the Department of the Interior, is the further development of a forestry organization essential in order properly to study and administer this feature of the work.

(5) That the Commission approve the organization of co-operative fire-protective associations of limit-holders, and the principle of contribution by the Dominion or Provincial Government in proportion to the benefits received.

Forest Inventory (6) That the Dominion Government be urged to begin a systematic study of the extent and character of forest resources in the forest reserves and other forest lands under its direct jurisdiction; and that a similar course be urged upon the provincial governments of Ontario, Quebec and New Brunswick as to forest lands within their boundaries.

(7) That wherever action is not now being taken, the systematic collection of complete statistics of forest fire losses be urged upon the Dominion Government and provincial governments.

Provincial Co-operation (8) That the Commission approve co-operation with the Government of Ontario in an examination of forest conditions outside forest reserves in the northern portion of that Province, south of the Clay Belt, and that favourable reciprocal action by the Ontario Government be invited along this line, as well as in developing a plan for recuperative measures in the Trent watershed.

Forest and Game Reserves (9) That representations be made to the Dominion Government, urging that favourable action be taken with regard to the proposed additions to the forest reserves recommended by the Forestry Branch.

(10) That the proposed establishment of a game preserve in the southern portion of the Rocky Mountains Forest Reserve, and in south-eastern British Columbia adjoining the Glacier National Park, be endorsed; and that favourable action be urged upon the Dominion Government and upon the Government of British Columbia.

Provincial Foresters (11) That, whereas, the provinces of British Columbia, Ontario and Quebec have seen the value of organizing a provincial forest service, representations be made to the governments of Nova Scotia and New Brunswick, looking toward the appointment of technically educated provincial foresters; this action to be taken for the purpose not only of securing a conservative use of the remaining forest resources, but also of stimulating and educating forest owners and woodlot owners in efforts at reforestation.

Method of Appointment (12) The Commission desires to place on record its opinion that it is important that all appointments in the forest services of the Dominion and provincial govern-

ments should be based on capability and experience, such as may be secured through civil service examination.

Classification of Land (13) That the Government of Ontario be urged to undertake a systematic classification of land in the Clay Belt, in advance of settlement, to the end that settlement may be properly directed, and that non-agricultural lands may be reserved from settlement and entry.

The report was adopted.

COMMITTEE ON FISHERIES, GAME AND FUR-BEARING ANIMALS

DR. C. C. JONES: The Committee on Fisheries, Game and Fur-bearing Animals has adopted the following resolutions which it submits for your approval:

Fisheries Protective Service 1. WHEREAS the present fisheries protective service is admittedly susceptible of much improvement;

THEREFORE BE IT RESOLVED that the immediate necessity of a re-organization of the service be called to the attention of the Minister of Marine and Fisheries and,

THAT in our opinion the following considerations should be recognized in such re-organization:

(a) The desirability of employing permanent officials paid sufficiently large salaries to enable them to devote their whole time to the work.

(b) The advantage of having each official, on appointment, a stranger in the district to which he is appointed, and, where practicable, of having him moved to a new district periodically.

(c) The immense gain in the efficiency of the protective service in having all appointments made on the sole ground of the capability of the appointee to discharge the duties of his position.

Instruction for Fishermen 2. RESOLVED that the Government of Canada should provide instruction for fishermen in the pursuit of their calling in a similar way to that in which it is providing instruction for farmers, and, further,

THAT the Biological Board of Canada be reorganized so as to provide for the permanent employment of a staff of scientific fisheries experts thereon.

Oyster Regulations 3. RESOLVED that it is expedient that the regulations regarding oyster fisheries be revised to the end that they be adapted to the conditions arising from oyster-culture

operations now being entered upon in Prince Edward Island, and especially that the regulation providing that oysters may be fished for and dealt in only from October 1 to March 31, be amended so as to permit oysters from private beds to be fished for and dealt in at any time of the year, thus preventing a glut in the market during October and November.

**Fisheries
Expert** 4. RESOLVED that the permanent appointment of an expert on fisheries and game, as recommended by the Committee on Fisheries, Game and Fur-bearing Animals, be approved and that the Chairman of the Commission and the Chairman of the Committee, with the assistance of the Secretary, be authorized to engage such an official.

DISCUSSION

DR. HEWITT: I wish to say a word or two on the second section of this report. In England, in connection with certain marine biological stations, they have regular classes of instruction for fishermen. For instance, on the Lancashire coast they have two marine biological laboratories and two schools for fishermen, and on the south coast, two different classes. In any future activities in this regard, they consider the possibility of co-ordinating the work of instruction with the establishment of marine biological stations.

**Officials
of Fish
Hatcheries** **DR. BRYCE:** This morning when the Biological Board was under discussion, I spoke with respect to this matter. For years we have been endeavouring to save our inland fisheries, and to increase them. Our fish hatcheries are one of the most important means by which we seek to accomplish this. I wish to call attention to the fact that those who are in charge of these hatcheries are often very lacking in expert knowledge. In fact, the hatcheries are very carelessly managed. For example, sometimes in sending the small fish or the material for propagation from one place to another it is carried in the most irregular way; in one instance, a man put the can against the car-heater so that the fry or ova were all dead before reaching their destination. Things like that occur too often. They show that there is a real necessity for giving expert instruction to those who have charge of these hatcheries.

**System of
Appointment** There are a great many employees and the system of appointment seems to be that any man who wants anything to do, if he is a decent sort of man, may have the position. When the Fisheries Department are appealed to, they say

that a lot of old men are in charge and they do not like to disturb them. What we want is efficiency and it is a serious drawback to the service to have this system of appointment.

Perhaps that resolution goes far enough this year. I do not care to move an amendment, but I would like to see it go further. It is absolutely necessary that instruction be given so that the men in charge of this very important matter of the propagation of fish and the study of their habits, should be scientifically trained for their work.

The report was adopted.

COMMITTEE ON PRESS AND CO-OPERATING ORGANIZATIONS

MR. MACKAY, in presenting the report of the Committee on Press and Co-operating Organizations, said: This matter was briefly discussed yesterday. The work of the Committee is progressing well and is a work that will logically grow. I wish to submit to you two resolutions that I have prepared, embodying the views of myself, Dr. Bryce and Mr. Patton, who has charge of the work of the Committee. The first is that the circulation of *Conservation* be increased as rapidly as the demand among interested readers such as public schools, the clergy, labour organizations, etc., makes it advisable; and that, whenever the occasion arises, the size of the publication be increased.

You all know now that it is not alarmingly large at present. An eight-page paper is not very large, especially when one considers the mass of material from which the Commission has to choose. This resolution will leave it to the option of the editor when he should increase the size from the present four-page issue. As to the necessity for an increased circulation, I think that is self-evident. The number now printed is twenty-two hundred a month. There may be a question as to the advisability of increasing it too much, because, if it is sent broadcast, the publishers of newspapers might not be so anxious to clip from it. We have considered this contingency and have come to the conclusion that an increase in the present circulation will not be detrimental as long as it is kept within reasonable bounds. If a circular were sent to school boards, asking if they desired to have it sent to them, I think we could secure a very desirable addition to our circulation. I think a communication should be sent first and if they express a favourable answer they should be put on the mailing list.

The work of publishing this is very heavy and the pressure on the editorial staff, especially when one considers the large number of reports they prepare for publication, must be enormous. They have not made any request for help, but I think we can take it on ourselves to recom-

mend that the staff be increased. They have been overworked during the past year. As a second resolution, I would therefore move that the editorial staff be so increased that more time can be devoted to the editorial work as well as to securing further co-operation on behalf of other organizations interested in conservation.

We have not done very much in the direction of securing co-operation of other bodies. I think the time has come when we have the material for doing so. The work that we are doing justifies us in going to other bodies and asking them to co-operate with us.

DISCUSSION

MR. MCCOOL: Would it not be well to send that communication to school inspectors rather than to school boards? Sending it to all the school boards of Canada would mean a tremendous amount of clerical work?

MR. MACKAY: I do not know that it will be so much work to send out one circular.

DR. ROBERTSON: I think it would be better to have it in the school library. The most scholastic body in Scotland has lately circularized all the boards to have the daily newspapers or some other publication taken up with the children at least once a week. I think this would be a capital thing to bring into the schools once a month or once a fortnight.

MR. SNOWBALL: If you want to reach the school boards in New Brunswick, you will have a very difficult task. There are only school boards in the interior towns; elsewhere there are trustee boards. I once undertook to circularize the schools in the county of Northumberland and it was a very difficult matter to reach the teachers. As far as *Conservation* is concerned, I think the children in the rural districts will be more interested than those in the towns. If you can get the Superintendent of Education for New Brunswick interested, he can reach them more quickly through the conventions than you can by individual circulars, and he can do it more effectively.

The reference to the reading of newspapers in the schools of Scotland recalled the days when I went to Upper Canada College in Toronto. The English master there sometimes devoted the whole time of the English lesson to a discussion of the newspapers. I remember once having to deal with the *Toronto Globe* for half an hour.

MR. MACKAY: Every Saturday, the *Globe* publishes an article on nature study, and I believe that that article is read in one-third, if not

one-half, of the schools of Ontario. Nature study is increasing rapidly in Ontario. I think that *Conservation* is of live interest to the children and this resolution leaves it open to the staff to adopt whatever means they find best to reach the schools most effectively. The superintendents of education could make suggestions as to the best means of reaching the teachers.

Office
Accommoda-
tion

MR. WHITE: With reference to what Mr. Mackay has said respecting the extension of our editorial and publication work, there is another question involved, and that is the question of offices. I have taken the question up already with two Ministers of Public Works but without success. We must move. At present, in order to go from one portion of our office to the most remote office, we have to travel two hundred and fifty feet, about the length of a short city block, and the situation from an administrative point of view is ridiculous. The young ladies who have to do practically all our clerical work are suffering in both health and eyesight. I think that if the Commission passed a resolution to the effect that the Minister of Public Works be requested to provide the Commission with other and better offices, it would facilitate the work and help out tremendously.

DR. HODGETTS: It is necessary that we should have better office accommodation for sanitary reasons. At the present time the officials are so crowded together that you are not getting the maximum amount of work from your experts, each of whom should have a separate office to himself. I would like to say, on behalf of my *confrères*, that we feel that Mr. White is doing the best that he can considering the space at his disposal. Indeed, no better arrangement could be made than that now existing. We feel that there is urgent need for better office accommodation, where we shall have sanitary offices with the maximum amount of sunlight and space, and office units which will give us uninterrupted time for official work.

MR. SNOWBALL: I beg to move a resolution along the line of Mr. White's suggestion.

DR. ROBERTSON: I would like to second that motion. It is important that the executive take this question up. I live in Ottawa and have occasion now and then to be in close contact with the work in the Commission offices. I think it is quite unfortunate, notwithstanding the pressure on space, that the Commission of Conservation should be left so long without either good accommodation or sufficient accommodation. I have great regard for men and women who can do good work in crowded quarters. There you have two or three men doing work for different branches of the Commission occupying one room. We are not

poor as a country. We can afford all we need to spend and I am not afraid to say that some other outlays would be extravagant waste if we do not have the staff of this Commission better housed, so that it can do its best work.

MR. PATTON: While this subject is under discussion, I would like to point out another fact that should be considered. The interior of the building at present occupied by the Commission is of wooden construction and the danger from fire is great. In fact, the building presents one of the worst fire hazards known to insurance companies, an open elevator shaft surrounded by a spiral wooden staircase. We have valuable records housed in this building, records that have cost us years of effort and thousands of dollars to secure, and if they were destroyed by fire, it would be a loss that money could hardly replace. Last summer we had two incipient fires within three weeks' time, and only the quick arrival of the fire brigade prevented serious damage. It seems to me that the matter of securing a fire-proof building is one that should be considered in endeavouring to get better office accommodation.

DR. BRYCE: I think that the best way, judging from experience I have had, would be to have a deputation of two or three prominent members of the Commission wait on the Minister of Public Works. We had to do that two or three times in connection with another organization with which I am associated and in that way we at last succeeded in getting what we wanted. If two or three members would go to see the Minister of Public Works they could perhaps accomplish more than the officials of the Commission.

THE CHAIRMAN: It may be better to leave it to the Executive.

It was decided that the matter would be presented to the Minister of Public Works by the Executive Committee.

COMMITTEE ON WATERS AND WATER-POWERS

**'Dead heads'
in Rivers** MR. MCCOOL: I am the only member of the Committee on Waters and Water-powers present, and there has been nothing brought to my attention that would require a report.

There is, however, one thing to which I would like to draw the attention of the Commission: it is the danger to the users of small boats by abandoned logs in the rivers. If you are running a motor boat on the Ottawa river there is not a point from here to the head of lake Timiskaming where you do not endanger your life or at least run the risk of injuring your boat. Something should be done to compel the Upper Ottawa Improvement Company, who have jurisdiction, to

remove 'deadheads' on notice being given of their exact location. They are left there year after year. Last year a few thousand were removed, but I venture to say that in one section of the Ottawa river near Pembroke I can count ten thousand deadheads within a distance of ten miles. This means a loss to the country and to the lumbermen. On one occasion it cost me \$30 to repair my boat owing to injuries received from a deadhead that was right within the steamboat channel, between two buoys, not more than forty feet apart. The lumbermen are not personally responsible, but I suppose most of them are stock-holders in the driving association and the men in charge of that association are responsible. At any rate, the matter is not brought to the attention of the lumbermen. Something should be done to call attention to this matter. If it is not desirable that we should take action as a commission, we could surely call the attention of the Government to it so that something would be done to decrease or diminish the danger to life caused by these deadheads. I would like an expression from you, Mr. Chairman, as to what you think should be done in regard to the matter.

THE CHAIRMAN: I have been trying to think how that could be made one of the duties of the Commission of Conservation. I have no doubt that the statement is quite true; there are a great many deadheads; but I am afraid that if we applied the same rule to all the dangers that exist throughout the entire country, the Commission would be very busy.

MR. MCCOOL: These logs are being lost to the owners and they are a loss to the country as a whole.

THE CHAIRMAN: If the Commission approves of this course and regards the matter as coming within its sphere, it would be in order to offer a resolution.

While each log is owned by some individual or corporation, they are under the control of a driving company in which many, but not all, lumbermen have shares.

MR. MCCOOL: There are thousands of motor boats and the people have a right to compel the driving association or the owners to take reasonable care in regard to these logs and not leave them as a menace to life year after year. I know of forty or fifty accidents last summer.

THE CHAIRMAN: Would you suggest a resolution?

MR. MCCOOL: I do not think it is necessary to go to extreme measures. If the attention of the authorities is called to it some action might be taken.

THE CHAIRMAN: As acting chairman I will see that the Secretary calls the attention of the proper authorities to this matter. If the driving companies' officers were directed from headquarters to remove the logs, a great deal of the danger would be eliminated. I will ask Mr. White to write to the secretary of the boom company and state that this was referred to in the annual meeting of the Commission and request his attention to the matter.

Dr. Robertson moved, seconded by Mr. Mackay, that the Secretary be directed to convey the cordial thanks of the Commission to the several speakers who have delivered addresses and presented papers at this meeting.

The motion was adopted.

THE ACTING CHAIRMAN (Hon. W. C. Edwards): I am sure if the Chairman of the Commission (Hon. Clifford Sifton) were here, he would be gratified at the attendance and the interest taken in the work of the Commission. He will appreciate the several papers read and reports made. It is quite evident that this Commission is making great progress. It has a great work to perform, one of the greatest that can be performed in the interests of the people of Canada. Let us hope it will continue to prosper for many years to come.

The Commission adjourned.

Wednesday Evening Session

A public meeting was held in the lecture hall of the Young Men's Christian Association at eight o'clock. The chair was occupied by Dr. James W. Robertson, who, in opening the meeting, said:

I must explain to our guest that the size of the audience is no measure of the importance to Ottawa of his subject, and further, that the size of the audience here is no indication of the size of the audience in Canada that will benefit by the report of his remarks, because the Commission publishes a report, issued in large numbers, which falls into the hands of the leaders of thought in Canada. In that way I am sure our friend will render Canada a good service by his presence here to-night.

I have occasion to make only a remark or two in introducing Dr. Benner. The Commission of Conservation is greatly concerned with two very large aspects of human life in Canada; one looks towards material things, the other looks towards human interests—and all the while they turn from one to the other. We, of the Commission of Conservation, hope that our people will be wise enough to use our immense

material resources for the enrichment of our lives, and then apply these enriched and strengthened lives to the further development of our material resources. That is the hope of the Commission and in that, we think, lies the future of Canada.

There are many institutions and many agencies helping to bring this about and I know of none that is doing more at the present time than the Industrial Research Department of the University of Pittsburgh. That university has a department devoted exclusively to research into industrial questions. Any one who adds to the sum total of the world's knowledge is a real benefactor. He is an equal benefactor who adds to the world's ability to apply the new knowledge to promote human comfort, and that is what this Industrial Research Department is doing—increasing our knowledge and adding to our ability to turn the new knowledge to practical use. The Commission on Industrial Training and Technical Education were very much impressed when in Pittsburgh a year and a half ago, by the excellence and thoroughness of the work done, and we were greatly charmed by the cordiality and courtesy of the people themselves. We like to have reciprocity of that kind and I am very glad, after having seen the laboratory and the people who carry on this work, to be able to welcome to Ottawa one of the workers in the person of Dr. Benner, who is to speak to us on "Smoke Prevention." We suffer in all cities under plenty of discomforts that might be removed; we endure conditions that should be corrected; and I hope that to-night's meeting will help us all to do a little more than we have been able to do in the past for the advantage of Ottawa in both respects.

A poet has well said that no one can soil sunshine. I learned that as a very young boy and I have treasured it ever since, more on account of its application to human life, than to the natural waves of light that beam on us. Nothing can spoil sunshine, but blackened and beclouded homes can so pollute the air that the pure sunshine does not reach our hearts. We hope for more of the pure sunshine in the air of Ottawa.

I am glad to present Dr. Benner, one of our neighbours, hereafter one of our friends, to speak to us on this subject of smoke prevention.

The Smoke Nuisance*

BY

RAYMOND C. BENNER AND J. J. O'CONNOR, JR.

INTRODUCTION

NEITHER for those who live in, nor for those who ever visit an industrial centre where large quantities of bituminous coal are burned, is a definition of the smoke nuisance necessary. Its effects are apparent on every side in such cities and no man, woman or child escapes them. The smoke nuisance is truly a modern plague.

It is, however, only within the last few years that any serious study has been given to the various phases of the problem, with the possible exception of the engineering phase. A remarkable change, however, has taken place. There is not a city in the country that has the smoke nuisance in an acute form, that is not aroused to the seriousness of the problem and that is not attempting in one way or another to abate it.

Investiga-
tion in
Pittsburgh

It is rather appropriate that the city of Pittsburgh, with its sobriquet 'The Smoky City,' should be held up as illustrating most forcibly the evils of the smoke nuisance, and that it should be the centre of an investigation which claims for itself comprehensiveness of plan, if no other merit. It leaves no phase of the smoke problem untouched. The donor of the fund for this investigation was actuated by the belief that a thorough investigation would reveal not only the nature, extent, and precise cause of the smoke nuisance, but also the remedies that would make its abolition possible and practicable. To carry out this investigation, he placed \$40,000 in the hands of Prof. Robert Kennedy Duncan, Director of the Department of Industrial Research of the University of Pittsburgh.

In this paper we will endeavour to present the various phases of the problem as they have come to our notice in our work in the smoke investigation.

* For a comprehensive scientific treatment of this subject the reader is referred to *Smoke, A Study of Town Air* by Julius B. Cohen and Arthur G. Ruston, both of the University of Leeds; London, Edward Arnold, 1912.

CHEMICAL ANALYSIS OF SOOT

When one considers the very different conditions under which coal is burnt, it is obvious that the character of soot must vary. All conditions in the furnace greatly affect the amount of carbon lost as soot, but the fact stands out, that where equal amounts of coal are consumed domestic installations are worse offenders than boiler furnaces. Loss of efficiency through the escape of soot itself is small. This is, however, an indication of a far greater loss in the shape of unburned, invisible gases, which loss may reach as high as 10 per cent.

Soot is composed of:

(1). *Carbon*, in a finely divided state. This, as is well known, is lamp black, the basis of most black paints, and it has a great covering power. It has the power of absorbing the corrosive acids which are produced by the combustion of coal containing sulphur.

(2). *Tar*. It is common coal tar which makes the soot cling tenaciously to everything with which it comes in contact. Tar contains carboic acid and other bodies of an injurious nature.

(3). *Acids*. Sulphurous acid, (H_2SO_3); sulphuric acid, (oil of vitriol, H_2SO_4); sulphuretted hydrogen, (H_2S); hydrochloric acid, (HCl).

These acids corrode and tarnish all the common metals. They attack many building materials, especially limestone. Draperies, paper, paints and other decorative materials suffer to no less extent. In burning the sulphur in the coal, the relatively inactive sulphurous acid is produced, but this soon becomes oxidized in the air to the far more active and corrosive sulphuric acid. These acids are also poisonous and detrimental to health.

(4). *Ash*. This is the least injurious of all the constituents of coal and may be, for all practical purposes, considered as common dirt.

(5). *Ammonia*, (NH_3). Ammonia is found in soot only in very small quantities and is of less importance than the other corrosive agents.

(6). *Arsenic*. This poisonous substance has been found in small quantities (generally less than 0.1 per cent. of the soot).

The amounts of these constituents of black smoke vary between the widest possible limits, depending upon the composition of the coal, methods of firing, amount of air, temperature of the furnace, and other conditions. The following analysis of soot taken from Cohen and Ruston's *Smoke, A Study of Town Air* gives a good general idea of what one must expect:



PITTSBURGH'S PALL OF SMOKE

SOOT FROM BOILER FURNACE

Constituents of Coal		Base of Chimney	13 feet from Base	70 feet from Base	Top of 110 ft. Chimney
Carbon	69.30	19.24	16.66	21.80	27.00
Hydrogen	4.89	2.71	0.86	1.44	1.68
Tar	1.64	0.09	0.28	0.80	1.14
Ash	8.48	73.37	75.04	66.04	61.80

DOMESTIC SOOT

Constituents of Coal	Kitchen Flue	Dining Room Flue	
		Bottom, 5 ft. from grate	Top, 35 ft. from grate
Carbon.....	76.80	52.34	36.45
Hydrogen.....	4.90	3.68	3.51
Tar.....	0.88	12.46	34.87
Ash.....	1.80	17.80	5.09

PER CENT OF FREE ACID IN SOOT

Sources of Sample	Base of Chimney	Top of Chimney
Brass foundry.....	0.00	0.65
Study flue.....	0.50	....
Kitchen flue.....	0.00	....
Boiler chimney.....	1.62	0.56
Fire-place.....	0.37	0.00

Dr. Russell found that the rain-water did not contain acid unless it also contained soot. The amount of free acid, calculated as sulphuric acid, in nine samples was found to be: 1.4 per cent; 0.5 per cent; 7.2 per cent; 0.0 per cent; 4.9 per cent; 0.8 per cent; 1.2 per cent; 2.3 per cent; 0.0 per cent.

From the foregoing analyses it is seen that the amount of tar and carbon in the soot from domestic fires is much higher than that from boiler furnaces, while in the case of ash, the reverse is true. Domestic soot is thus by far the more objectionable and is produced in greater quantities from the same amount of coal. The amount of acid depends more upon the amount of sulphur in the coal than upon any other single factor, and is given off with the products of combustion whether smoke is produced or not. When, however, soot is produced, a large percent-

age of the acid is occluded in the soot, where it is more injurious than if allowed to escape alone into the air. The soot coming in contact with metal, stone and decorations is made to adhere firmly by means of its tar content, in reality covering the surface with a coat of black paint. This acid is not readily washed away by the rain, but continues to act until it is all used up. The acid absorbed from the air by the rain-water, would be more injurious if it did not drain from most surfaces before its action is completed.

DETERIORATION OF BUILDINGS AND BUILDING MATERIALS

After considering the various phases of the chemical composition, one can readily understand why houses in a smoky atmosphere look grimy and miserable; and also why the use of skylights is, in many places, made impossible, while, in others, it is necessary to so arrange them that they may be readily cleaned. Without frequent cleaning such skylights would soon become useless because of the accumulation of soot. Again, changes in design to make a different arrangement of drain pipes, are, at times, necessary in order to prevent the splashing upon the building of rain-water containing soot.

Effect on Building Materials In a smoky city, too, much more glazed tile and vitrified brick are used for the outside of buildings, as it makes the cleaning a comparatively simple matter—washing alone being necessary. Building stones, such as limestone, marbles or sandstones with calcareous binding material, are rapidly disintegrated by the acid in the soot and air. Therefore, materials such as granite, sandstone (with a silicious binding), and brick, which are not attacked by the sulphurous and sulphuric acids in the soot, should be utilized. But, unfortunately, that stone which is most easily affected, disintegrated by the atmospheric acid and decolourized by soot, is the one which is easiest to work into the desired shape for building purposes. Granite and similar stones, which are practically never attacked by acid and are impervious to moisture, offer little chance for the soot to lodge. They are readily cleaned, but are extremely expensive because of the difficulty in working them. Thus the architect finds himself confronted with financial as well as æsthetic considerations. Stone may be cleaned but, at most, that is but a temporary expedient and represents a periodical tax on the owners. The logical thing is to make cleaning unnecessary by water-proofing the stone and doing away with the smoke. The sulphuric acid acts on calcium carbonate, (the principal constituent of stones, which is most easily corroded by the acid in the

soot), forming calcium sulphate (gypsum) which is more soluble in water than the calcium carbonate. But, at the same time, the acid causes the stone to undergo a physical change, making it swell and become porous, friable and easily disintegrated; it also roughens polished surfaces, thus rendering them more liable to attack by acid, by moisture and by the weather. Dr. Angus Smith has found mortar to contain as high as 28.33 per cent. of sulphuric acid. This, acting upon the calcium carbonate, would form 48.16 per cent. of calcium sulphate.

The effect of the sulphuric acid, occluded in soot, on most metals is rather marked, and greater than the action of a like amount of acid in the rain-water or air. It would seem from observations taken in Pittsburgh, that the soot containing acid is made to adhere to the metal by means of its tar content. This, together with the metal and acid, causes electrolysis to take place, making corrosion much more rapid. In the case of iron and aluminium, the oxide and basic sulphate are produced, at least in part, from the sulphate, and the acid is used over and over again. To verify these observations experimentally, duplicate sets of various metals were fastened to two boards. One set was protected from the soot in the air by means of cheese cloth, yet still exposed to the air and rain. The other set was left unprotected. The pieces of metal left unprotected from the soot show a much greater amount of corrosion than those which were protected.

The following figures obtained by Messrs. W. B. Worthington and A. Rattray, showing the corrosive effect of the acids in the air, are of interest. To quote from Cohen: "A number of rails were placed in suitable positions by the side of the line, and weighed at intervals, and the loss of weight recorded. The rails were of the ordinary railway section weighing 86 lbs. per yard. The annual loss of weight from corrosion was as follows:"

CORROSIVE ACTION OF ACIDS IN THE AIR

Average Annual Loss in Weight in lbs. per yard		No. of years Observations
1. In the centre of the town.....	1.04	17
2. In adjoining place in smoky tunnel.....	1.48	13
3. In a wet place in same tunnel.....	1.71	8
4. On the sea-coast amongst sand hills.....	0.18	17

In* designing both interior and exterior decorations for buildings the smoke question must receive as much consideration from the architect as do the tastes of the owners of the buildings. Interior draperies and paper are soiled much

more quickly in a smoky city than elsewhere. If light paper is used in papering the rooms, it must be cleaned every six months and new paper put on every year to keep it looking even half as well as one would wish. The acid in the soot attacks draperies, rendering them useless in a short time. The extra wear of cleaning also shortens their life markedly.

On interior painting the effect is not as marked because cleaning is done oftener. But the problems of interior decoration, and of keeping the outside of a building clean in smoky places, are exceedingly difficult to solve. The statement has been made by a number of painters that they have done jobs which looked as bad after a few days' exposure as they did before the painting was done. Soot certainly destroys the æsthetic value of paint very quickly. The time which it takes to accomplish the pollution is, of course, dependent upon the amount of soot in the air, the colour of the paint, and the tar content of the soot. The number of paintings needed to keep the same building as presentable as in a smoke-free city will naturally vary greatly. Cases can be cited where it is necessary to paint three or four times as often as would be required for protective purposes only. In the majority of cases, in smoky cities, the number of paintings required is probably doubled. Sometimes it is necessary to remove the soot and tar and to wash the building before applying the new coat of paint. This washing also removes the paint, often making two coats necessary in place of one for a proper covering. After the wood has received ten or twelve coats it is customary to burn off the paint. This is an additional expense and likewise increases the fire risk. The action of soot on the wearing qualities of the paint also depends on many factors involving the chemical composition of the paint and soot. The soot may be acid, neutral or even slightly alkaline. Places are known where the soot seems to act as a protective coating, while in others it corrodes the painted surface, destroying the gloss and rendering it much more easily weathered. The latter is probably true in those cases where the coal burned contains a lot of sulphur and the soot is consequently quite acid.

SMOKE AND THE WEATHER

From a preliminary study of available data and a perusal of the literature concerning the meteorological branch of our work, Mr. H. H. Kimball has arrived at the following conclusions:

(1). That city fogs are more persistent than country fogs, principally because of the increased density due to the smoke which accumulates in them.

(2). In consequence of the fog prevalence, there are fewer hours of sunshine in the city than in the country.

(3). The sunshine is less intense than in the surrounding country, the light of short wave length (the blue light in the spectrum) suffering the greater depletion.

(4). Daylight, which often depends entirely upon diffuse daylight from the sky, is depleted by smoke in greater proportion than direct sunlight.

(5). Minimum temperatures are markedly higher in cities than in the country, in part, of course, because of city heating, but principally because the smoke acts as a blanket to prevent the escape of heat at night.

We find, when using a chemical method for determining the intensity of daylight, that, ten miles from the centre of Pittsburgh, on many days there is two or three times the light as measured by chemical action, that there is in the city proper.

The amount of soot in the air varies between 21 and 430 mg. per 1,000 cubic feet of air, depending upon the direction and strength of the wind. That is, we have twenty times the soot in the air on a dark day that we have on a clear, bright day.

Visibility determinations (the distance one can see) vary greatly from day to day. With the accumulation of more data we hope to trace a relationship between these determinations and the amount of soot in the air.

Determina- tion of Soot-fall

The soot-fall (the amount of soot which falls on a given area in a given period of time) is of interest to us from many viewpoints. A large number of determinations have been made, and, although they vary greatly in different parts of the city, those made at the same stations remain remarkably constant. The total fall varies between 28.42 and 225.6 tons per square mile per month for the cleanest and dirtiest parts of Pittsburgh, respectively. These figures represent the entire dust fall, which is jet black and is considered here, as elsewhere, to represent the soot-fall. Analyses are, however, being made for tar, organic and inorganic matter.

HOW VEGETATION IS AFFECTED BY SOOT

Trees and shrubs add to the beauty of a city. They are not intended primarily as a source of income. The effect of soot on vegetation

may, therefore, be considered more particularly a question of æsthetics. Then, too, as the smoke nuisance is usually prevalent only in cities of some size, its effect is not felt on the crops in the country districts. Yet it makes its injurious action felt, both directly and indirectly. The smoke clouds limit the available daylight for vegetation in two ways.

(1). By smoke clouds. The amount of sunlight as well as diffuse daylight is not nearly as great in a smoky city as it is normally.

(2). By lessening the absorption of light by leaves. If the amount of light cut off by the deposit of tar upon glass can be considered in any sense as a measure, the tar deposit on the leaf is by far the most important factor in preventing light absorption.

The tarry matter contained in the soot coats the leaves and chokes the stomata. This injury is mechanical. Its destructive action does not, however, stop there. Like all other forms of finely divided carbon, soot has the power of occluding other substances. The tar (containing phenols and other bodies of a similar nature) and acids are all poisonous to plant growth and greatly lower the vitality, the acids in particular limiting the activity of the soil organisms, especially those of nitrification.

Cohen and Ruston find that the relative assimilations of laurel leaves in districts where the air contains different amounts of soot vary from 11.6 to 100. Crops of radishes and lettuce grown in different sections of the town show the possibility of correlation of the known atmospheric impurities with the yield of the crops. Trees automatically keep record of the presence of any inhibiting factor by the narrowing of their annual rings. In one case the cross-section of a tree plainly showed evidences of the building of a smoke-producing factory near at hand.

We find that such flowers as roses and carnations will not thrive within the smoky limits of Pittsburgh, and that, for this reason, many greenhouses have been forced to move beyond this deleterious influence. Furthermore, many trees are injured if not entirely killed by the smoke.

SMOKE AND DISEASE

The effect of smoke on health has always been a much mooted question. At the present time in the city of Pittsburgh, it has assumed a very practical form. The city has appropriated considerable money for a tuberculosis hospital and a dispute has arisen as to its situation. Some contend that it should be placed outside the city limits, while others hold that more intensive work can be done if it is erected in that

part of the city where the disease is most prevalent. The advocates of the first situation, as part of their argument assert that the smoky atmosphere is detrimental to those suffering from the disease, or, at least, that it retards their recovery. The weight of opinion seems to be against this view.

Dr. William Charles White, in a paper read before the Fifteenth Congress of Hygiene and Demography said:

“As a result of our clinical study we have come to the conclusion that the general death rate from tuberculosis in Pittsburgh is low, that there is nothing in the smoke content of the air which in any way stimulates the onset of tubercular process or militates against the rapidity of recovery from tuberculosis when once this disease has been contracted.”

Dr. White's studies along this line, however, led him to declare, that, from his study of the air content of Pittsburgh as a factor in the causation of disease, that smoke has an important bearing on the pneumonia death rate. Dr. White is in favour of a popular crusade for the prevention of pneumonia similar to that which has been waged against tuberculosis. Of course, in such a campaign serious attention would be given to the smoke problem.

Dr. Louis Ascher of Konigsburg, who has made an extensive study of the effect of smoke and dust on disease, maintains that in Germany a smoky atmosphere is responsible for the increased mortality from lung diseases other than tuberculosis. He holds that not only is this increase taking place, but that persons who are the subjects of pulmonary tuberculosis die in smoke-laden districts more rapidly than those persons similarly affected, but living elsewhere. Of the fact that carbon makes its way into the lungs of those who live in a smoky city, there is no doubt. Dr. Klotz has found large amounts of it in the lungs of Pittsburghers, as the following statement indicates:

10.6	grams	in	the	lungs	of	a	man	28	years	of	age.
3.4	“	“	“	“	“	“	“	37	“	“	“
2.4	“	“	“	“	“	“	“	39	“	“	“
4.2	“	“	“	“	“	“	woman	37	“	“	“
2.6	“	“	“	“	“	“	“	44	“	“	“

According to Lehmann, while the sulphur dioxide contained in the soot is absorbed by the nasal mucous membrane, the particles of carbon are carried further into the respiratory passages. Finally reaching the lungs, they are deposited there, having, meanwhile, in their descent, given up to the bronchial mucous membrane and the lining membrane of the lungs some of the acids they retained.

Dr. Holman finds that soot acts as a disinfectant. Water seems to dissolve the disinfecting agents in the soot making them more active than when dry. Carbon floating in the air seldom, if ever, carries bacteria, unless it has lodged on the ground and is again blown into the air.

**Pittsburgh
Sore Throat** Dr. Day finds that diseases of the nose and throat are not appreciably more prevalent in smoky cities, but that they are more severe and harder to cure. This is probably due to the cracking of the mucous membrane by the dry atmosphere in the houses, and subsequent irritation by dust, quite as much as to the action of the smoke. Singers, on visiting Pittsburgh, usually get Pittsburgh sore throat, which lasts about seven days, when they become acclimated for the time being. Unfortunately though, the same thing occurs on each succeeding visit to the city.

THE COST OF SMOKE

We are coming more and more to look at the smoke problem as fundamentally an economic one. We have been told time and again that smoke and soot are the products of imperfect combustion which means a waste of fuel, and, consequently, unnecessary expense. But there is more than this to the question: smoke is not only a tax to the producer of it, but it causes a loss to every man, woman and child in the community.

**Economic
Loss Due
to Smoke** Many estimates of varying degrees of accuracy have been made of the financial damage due to smoke and soot. In 1905, the Hon. F. A. Rollo Russell estimated the damage in London to be \$26,000,000. The largest single item of this amount was \$10,750,000 for extra washing and wear and tear of linens. The Cleveland Chamber of Commerce in 1909 placed the loss for that city at \$12 per capita or \$6,000,000 for the entire population. Matthew Nelson, Chief Smoke Inspector of Cincinnati, asserted that the loss there, was \$100 per family. Mr. Paul Bird, in his report as Chief Smoke Inspector of Chicago, declared that the loss in Chicago was at least \$17,600,000, or \$8 per capita. In a paper read before the American Civic Association, Herbert M. Wilson, Chief Engineer of the United States Bureau of Mines, stated that a careful government inquiry into the toll paid by the people of the United States showed a total of over \$500,000,000 or a toll of \$17 a year for every man, woman and child in the larger cities.

These figures are startling. It is the task of those who are engaged in the economic phase of the smoke investigation to make the estimates for Pittsburgh as accurate as possible by inquiring into the various items that go to make up the total. They are attempting to deal not in sweeping generalizations, but in what Mr. Wood, in speaking of the work of the Pittsburgh survey, termed, "piled-up actualities."

Cost of Cleaning Buildings About twenty-five per cent of the cleaning expense of office buildings in the city of Pittsburgh is necessary because of smoke. When it is realized that the cleaning bill of some of the office buildings is \$75,000 per year, some conception of the magnitude of expense may be formed. To cite a single item: It costs the owners of a certain building in Pittsburgh \$320 more a month for window cleaning than if the building were located in New York or Philadelphia. The lighting bills in office buildings are increased by half, because of the condition of the atmosphere in Pittsburgh.

Damage to Goods by Smoke The damage to goods in wholesale, retail and department stores runs up into the thousands, amounting to as much as \$30,000 a year in the case of one store. We have found that it costs from 33 per cent to 50 per cent more to conduct a hospital in Pittsburgh than in other cities. For instance, in the matter of extra cleaning force, one hospital could save \$3,000 a year, and another \$1,200 if the city were cleaner. In large industrial cities many buildings are washed down or painted once or twice a year. To one firm in Pittsburgh this means an extra expenditure of \$700 and in the case of another firm, of \$500.

Laundry Expense in Pittsburgh Census reports on laundries show that the people of Pittsburgh pay more for laundry work than those of almost any other city and that it costs the laundrymen more to do the work. These figures, when compared with the report of smoky days in various cities, seem to indicate that atmospheric conditions, and not custom, determines, in a large measure, the per capita amount of laundry business done.

The laundry schedules of men who now live in Pittsburgh, but who come from other cities, show that they pay from one-third to a half more in Pittsburgh than they paid formerly. They wear at least two more shirts and two more collars per week, which means an extra expense, at the lowest, of \$16 each year. The laundry schedules of women who have lived in other cities, show that they each pay \$24, more a year in Pittsburgh than elsewhere. The toll paid to steam laundries alone amounts to something like \$800,000. The extra expense

in labour, time and effort in home laundry work is much greater than that of steam laundries. As a minimum estimate, Pittsburgh pays a toll of \$1,500,000 in laundry and home washing bills.

Dry cleaning is found necessary far more frequently in Pittsburgh than in other cities owing to the atmospheric conditions. Because of this, too, a greater supply of clothing is required, and clothes wear out sooner. Moreover, Pittsburghers are limited in the selection of colours of clothing. Especially is this true of woollen goods, furs, hats and trimmings. The average annual bill of a man in Pittsburgh who sends his clothes to a dry cleaner is \$18; a woman's bill is about \$20. This is half more than the man or woman would pay in a cleaner city. The total extra cost of dry cleaning in the city of Pittsburgh is about \$750,000.

**Property
Values and
the Smoke
Nuisance**

In October, 1912, as a result of the appeal of the property owners in the 24th and 44th wards of that city, who declared that recent sales in their vicinity were at prices far below the assessed valuation because of the smoke nuisance, the Philadelphia assessors reduced the assessed valuation of each from \$500 to \$2,000 on some three hundred properties. A preliminary survey of conditions in Pittsburgh showed that a similar state of affairs existed there. In some sections, there has been a depreciation of fully 50 per cent in sale prices. Such property is near mills or railroads or, as is often the case, near both. Houses in such neighbourhoods are very difficult to rent, and, in order to rent at all, there must be a reduction in the rental price of at least 20 per cent. Sometimes people rent these houses and move as soon as they become acquainted with the nuisance.

To all these losses—and there are many others—must be added the cost of the fuel wasted through imperfect combustion. In 1881, when a little less than 3,000,000 tons of coal were being used in Pittsburgh, William Metcalf, an eminent engineer and mill-owner, estimated the cost of the coal that was wasted, by poor combustion in mill and factory furnaces at \$1,063,000. At the present time, Pittsburgh burns in the neighbourhood of 15,000,000 tons of coal annually, the cost of which is about \$19,000,000. It has been estimated, on the basis of efficiency tests, that 20 per cent of this goes up the chimney in the form of smoke.

THE PROBLEM OF ABATEMENT

The problem of the abatement of smoke presents many and various phases. In the method of attack, in the different cities, there are a number of factors which must be taken into consideration.

(1). The topography of the country is an important factor in the mitigation of the evil. A hilly country, such as that in which Pittsburgh is situated, confines the smoke to the valleys, so that it is not readily carried away by the wind as it is in Chicago and other cities built on a flat country.

(2). The situation of the smoke-producing plants with reference to the residence district must be taken into consideration. In many places, this proves a source of great annoyance; in others, it tends to simplify the problem. In Pittsburgh, the mills are situated along the Ohio, Allegheny and Monongahela rivers, which run through the city, bounding at least three sides of the best residential districts. Recalling the topography of the city, one can see that this does not facilitate abatement.

(3). The necessity for burning soft coal in private dwellings is a great bane, the methods for burning it without smoke not being nearly as well perfected as in the case of large installations. About six per cent. of the coal burned in fire-places and other domestic installations escapes through the chimney as soot, while only about 0.5 per cent. of that burned in power plants is thus wasted. That is, weight for weight, the coal burned in domestic installations is twelve times more a nuisance than that burned in a hotter furnace under a boiler. Cities which have at their disposal a supply of natural or other cheap gas, are greatly favoured.

(4). Cities, such as Philadelphia, which have access to cheap hard coal, should have very little need of consideration in connection with the smoke problem. Anthracite coal is a smokeless coal. On the other hand, soft coals vary greatly in the ease with which they are burned without smoke. Different types of mechanical stokers and other kinds of installations are required in many cases. Each district presents new engineering problems. An installation which gives perfect satisfaction with one kind of fuel will not of necessity do so with another.

(5). Smoke abatement is not a difficult task in non-manufacturing towns, where power-plants are the exception rather than the rule. In manufacturing towns, on the other hand, long continued campaigns of education are necessary before even the enforcement of an ordinance is possible.

After a thorough perusal of literature on smoke and a general survey of the smoke-producing plants in the Pittsburgh district, a number of facts were firmly established:

(1). That the production of smoke was in most cases unnecessary and could be prevented with economy to the power-plant operator.

(2). No thoroughly practical method is known for abating the smoke in round-houses, coke ovens, and one or two special furnaces.

(3). No matter how perfect a smoke-preventing device has been installed, without intelligent operation, it will not be of much value for the prevention of smoke; that is to say, the fireman must be educated to do his work in a proper manner.

(4). Public opinion views the smoke nuisance as implying industry and prosperity for the city.

(5). No investigation of the subject as a whole has been made by the co-ordinated efforts of a group of men.

We find that certain types of installation are notorious 'smokers' while others are practically free from smoke at all times.

Furnace	No. of Stacks Observed	No. Violating the City Ordinance
Type 1	45	26
" 2	21	3
" 3	8	0
" 4	23	15
" 5	15	0
" 6	1	0

The human element must not, however, be neglected in this connection. It is possible for a skilled fireman to operate a hand-fired furnace without objectionable smoke, even if it is not correctly constructed. But given an unskilled or careless man in charge, the most modern of plants may become the most objectionable smokers in the neighbourhood.

To do away with smoke and thus increase efficiency, one must bear in mind three things:

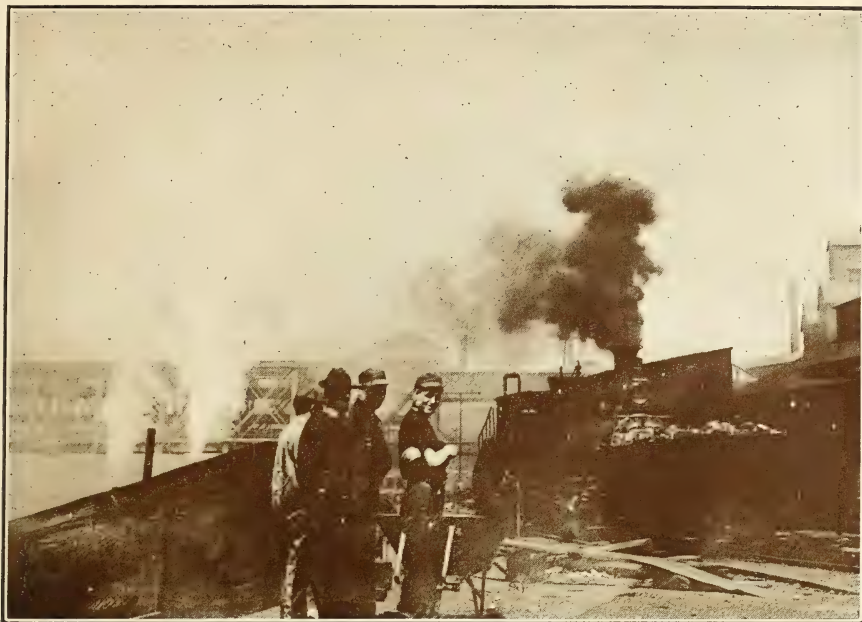
(1). The mechanical contrivance for burning the coal must be suited to the purpose.

(2). The fireman must be trained to do his work in a proper manner.

(3). Some method of furnace control should be employed—CO₂ recorders and pyrometers—so that the efficiency of the furnace and the amount of smoke produced may be known both to the fireman and the superintendent.

THE QUESTION OF LEGAL REGULATION

As legislation follows rather slowly, the agitation for, and need of certain reform measures, and, as the question of smoke abatement in the

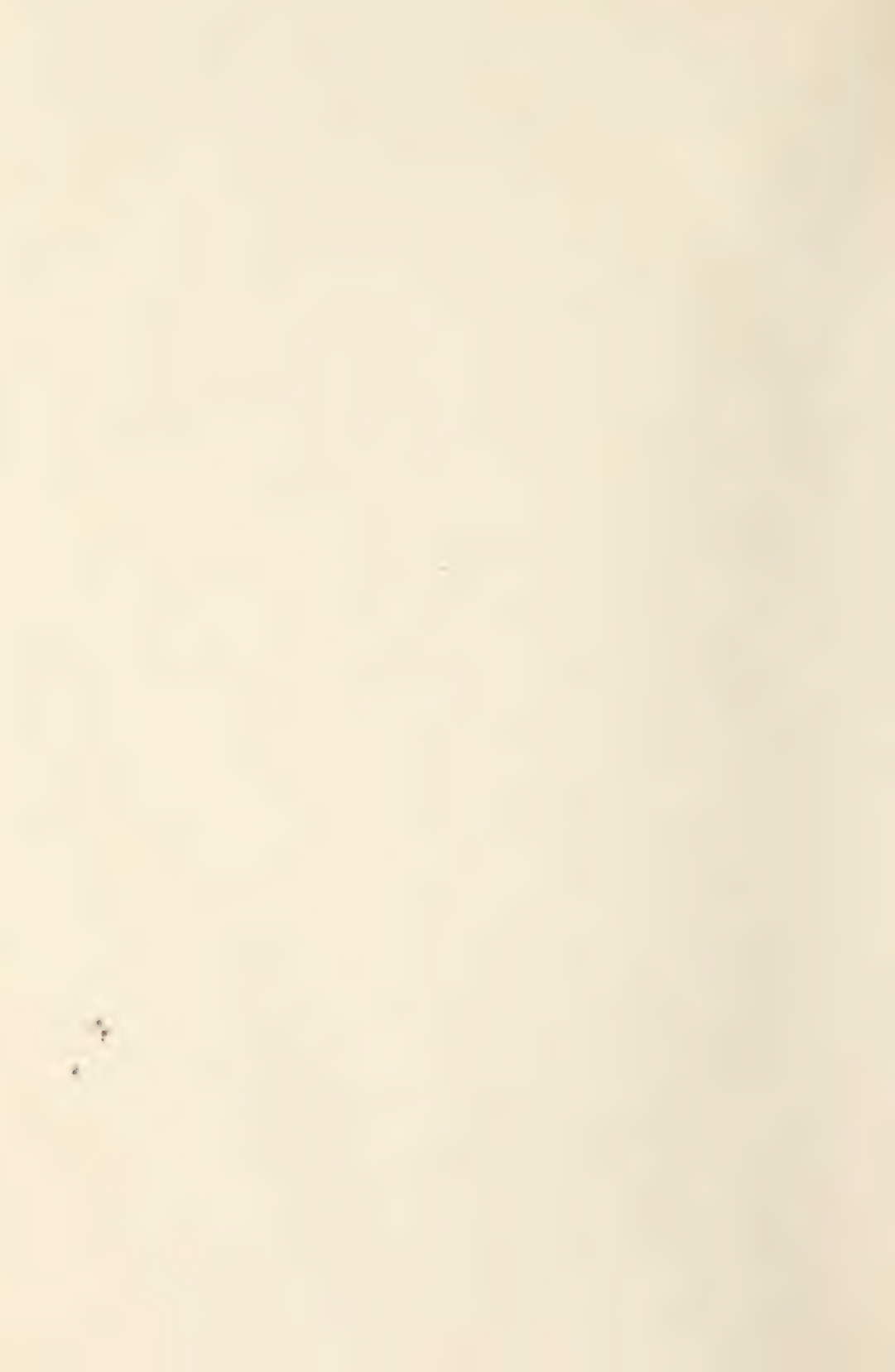


THE RAILWAY LOCOMOTIVE CREATES A SMOKE NUISANCE IN CITIES



ADDING TO THE PALL OF SMOKE OVER PITTSBURGH

Rivers run through the main portion of the city and the steamboats add their quota of smoke to the murky atmosphere



United States is of comparatively recent date, there need be no surprise to find that the passage of ordinances on the subject, especially of ordinances that are in any way effective, has taken place only in the last ten years. This is not true, however, of England, where the law took cognizance of the smoke nuisance as early as 1273, when the use of coal was prohibited in London as prejudicial to public health. There is in existence a statement that one John Doe was in 1306, tried, condemned and executed for burning coal in the city of London. Since 1273 there have been numberless proclamations, parliamentary commissions, laws and ordinances on the smoke nuisance.

**Anti-Smoke
Legislation
in U.S.**

It was about thirty years ago that cities of the United States began to pass smoke ordinances. However, as early as 1856 an ordinance was introduced in the council of Cleveland to prohibit the use of soft coal in manufacturing plants, and sometime prior to 1869, Pittsburgh passed an ordinance which contained the provision "that no bituminous coal or wood should be used in the engine of any locomotive employed in conducting trains upon any railroad." Chicago and Cincinnati were the first cities to pass general ordinances on the subject, the first ordinance in Chicago being passed in 1881. Pittsburgh did not have an ordinance until 1891, and then it applied only to a section of the city.

At the present time all cities having over 200,000 population—with the exception of a few cities in which the problem is not acute—have smoke ordinances. Many of the smaller cities which are far-sighted enough to be on their guard have enacted anti-smoke laws.

The popular conception of the police power is to consider it as extending only to the protection of life and property in its narrow sense, and the maintenance of public order. But more and more it is becoming apparent that its great sphere is public health, and general welfare. This police power may be delegated by the state legislature to municipal corporations and this is the power under which municipalities declare certain acts nuisances. While a municipality may be authorized in general terms to declare what shall constitute a nuisance, it may not declare that to be a nuisance which in fact is not. In common law 'dense' smoke is not a nuisance *per se* though some courts have held it to be so in a populous city.

The Pittsburgh ordinance of 1906 was held void for two reasons, one of which was "that the legislature of Pennsylvania had likely not given the city sufficient authority to pass an ordinance upon the subject." The city at once sought and secured the power. Thus, it can be seen that, in order to deal with the smoke nuisance, cities are required

to seek specific authority from the state legislature. When a municipality is thus empowered it is then in position to pass an ordinance.

**Requirements
of a Smoke
Ordinance**

It is a difficult matter to say what the essential provisions of a smoke ordinance should be, and yet, from the experience of the different cities, it is possible to point out certain features that are necessary if the ordinance is to accomplish any notable results.

It is becoming characteristic of the age to count on preventive rather than remedial legislation for telling achievement. This thought leads us to one of the fundamental functions of a smoke ordinance, that it should make provision for prevention, so far as possible, of the installation of improperly designed furnace equipment. For this purpose, the ordinance should provide that plans and specifications for all construction work on furnaces be submitted to the smoke inspector, and be approved by him before the work is started. This feature leads us to the point that since it is so important a provision, the ordinance should state the qualifications of the man whose duty it is to pass on these plans and specifications. Surely it should provide that he be an engineer, "qualified by technical training and experience in the theory and practice of the construction and operation of steam boilers and furnaces."

An ordinance, of course, should state the density of smoke that is to be permitted, and provide a standard of measurement. On the first point, care should be taken lest the provision be somewhat vague, for this has been the rock upon which many ordinances have been wrecked in court. In speaking of this feature—the fixing of the density—Mr. S. B. Flagg of the United States Bureau of Mines, says: "The requirements should represent the best practice, the standard set should not be an impossible nor an impracticable one, neither should it represent ordinary or poor practice." In some ordinances, a stack well within the limits set by the ordinance may be responsible for the discharge of many times as much soot as another stack which violates the ordinance. Such an ordinance is obviously incongruous.

The mere enactment of a reasonable, efficient and enforceable smoke ordinance is not enough. The ordinance must be enforced. At this point most of the cities have fallen short. Sometimes the wrong methods are used in the enforcement of the ordinance, most of the time the methods employed are altogether too lax and feeble to secure even mediocre results. To remedy this situation there is one great weapon—public opinion. However, in order to educate, concentrate and focus public opinion, a league or union of civic and commercial organizations

should be formed in each city. Such organizations seem imperative in American cities until better results are secured by way of enforcing smoke ordinances. Eternal vigilance on the part of the public is the price of a smokeless atmosphere, but to those who enjoy such a blessing this effort brings ample returns.

Enough has been said to suggest that the smoke nuisance is an economic question and that the people who are most concerned are not those who make the smoke but those who suffer because it is made. It is necessary, therefore, to educate the public as to the evils of the nuisance, so that an active and intelligent public opinion may be brought to bear on those who are responsible for it. As has been pointed out, even with the smoke makers, this problem is an economic one. The abolition of the smoke nuisance, therefore, unlike many other social nuisances against which outcry has been made, would result in direct and immediate gain both to the public at large and to those who are chiefly responsible for the nuisance itself.

Appendices

I. Canadian Town Planning Laws

Nova Scotia

AN ACT RESPECTING TOWN PLANNING

(Chap. 6, 2 Geo. V. Passed May 3rd, 1912)

SECTION

1. Short title.
2. Planning scheme, when to be made.
3. Planning scheme, how made.
4. Lands to be included.
5. Variation or revocation.
6. Land likely to be used for building purposes.
7. Area.

SECTION

8. Approval of scheme in certain cases.
9. Regulations.
10. Powers of Council to remove building, etc.
11. Compensation for injury.
12. Property injuriously affected.
13. Power to purchase lands.
14. Power to form company.
15. Company.

BE it enacted by the Governor, Council and Assembly, as follows:
1. This Act may be cited as "The Town Planning Act, 1912."

2. A town planning scheme may be made in accordance with the provisions of this Act as respects any land which is in the course of development or appears likely to be used for building purpose, with the general object of securing suitable provision for traffic, sanitary conditions, amenity and convenience in connection with the laying out and use of the land, and of any neighbouring lands.

3. Any city, town or municipality within the meaning of this Act may prepare such a town planning scheme with reference to any land within or in the neighborhood of their area, and any city, town or municipality may adopt, with or without any modifications, any such scheme proposed by all or any of the owners of any land with respect to which such city, town or municipality might have prepared a scheme.

4. Where it is made to appear to the council of any city, town or municipality that a piece of land already built upon, or a piece of land

not likely to be used for building purposes, is so situated with respect to any land likely to be used for building purposes, that it ought to be included in any town planning scheme made with respect to the last mentioned land, such council may authorize the preparation or adoption of a scheme including such piece of land as aforesaid, and providing for the demolition or alteration of any buildings thereon so far as may be necessary for carrying the scheme into effect.

5. A town planning scheme may be varied or revoked by a subsequent scheme prepared or adopted and approved in accordance with this Act, and the council of any city, town or municipality on the application of any person appearing to them to be interested may, by order, revoke a town planning scheme if they think that under the special circumstances of the case the scheme should be so revoked.

6. The expression "land likely to be used for building purposes" shall include any land likely to be used as or for the purpose of providing open spaces, roads, streets, parks, pleasure or recreation grounds, or for the purpose of executing any work upon or under the land incidental to a town planning scheme, whether in the nature of a building work or not; and the decision of the council of any city, town or municipality interested, whether land is likely to be used for building purposes or not, shall be final.

7. Special provisions may be inserted in every town planning scheme defining the area to which the scheme is to apply, and the authority which is to be responsible for enforcing the observance of the scheme, and for the execution of any works which under the scheme or this Act are to be executed by any city, town or municipality, and also for dealing with any special circumstances or contingencies, and for suspending, so far as necessary for the proper carrying out of the scheme, any statutory enactments, by-laws, regulations or other provisions under whatever authority made which are in operation in the area included in the scheme. Provided that where the scheme contains provisions suspending any enactment contained in a public general Act, the scheme shall not come into force unless the same has been approved by the Governor-in-Council.

8. Where land included in a town planning scheme is in the area of more than one city, town or municipality, or is in the area of a city, town or municipality by which the scheme was not prepared, the scheme shall not come into force unless the same has been approved by the Governor-in-Council.

9. (1) The council of any city, town or municipality may make regulations for regulating generally the procedure to be adopted with respect to applications for authority to prepare or adopt a town planning scheme, the preparation of the scheme, obtaining the approval of the council to a scheme so prepared or adopted, and any inquiries, reports, notices or other matters required in connection with the preparation or adoption or the approval of the scheme or preliminary thereto, or in relation to the carrying out of the scheme or enforcing the observance of the provisions thereof.

(2) Provision shall be made by such regulations—

(a) for securing co-operation on the part of such city, town or municipality with the owners and other persons interested in the land proposed to be included in the scheme, at every stage of the proceedings, by means of conferences and such other means as may be provided by the regulations; and

(b) for providing that notice of the proposal to prepare or adopt the scheme should be given at the earliest stage possible to any council interested in the land.

10. (1) The council of any city, town or municipality may at any time after giving such notice as may be provided by a town planning scheme, and in accordance with the provisions of the scheme—

(a) remove, pull down or alter any building or other work in the area included in the scheme, or in the erection or carrying out of which any provision of the scheme has not been complied with; or

(b) execute any work which it is the duty of any person to execute under the scheme in any case where it appears to the council that delay in the execution of the work would prejudice the efficient operation of the scheme.

(2) Any expenses incurred by a city, town or municipality under this section may be recovered from the persons in default in such manner and subject to such conditions as may be provided by the scheme.

(3) If any question arises whether any building or work contravenes a town planning scheme, or whether any provision of a town planning scheme is not complied with in the erection or carrying out of any building or work, the question shall, unless the parties otherwise agree, be determined by three arbitrators (one appointed by the council, a second by owner of such building or work, and the third by the two so chosen) and the decision of such arbitrators or any two of them shall be final and conclusive and binding on all persons.

(4) If the owner of such building or work, within ten days after the service of a notice on him of the appointment of an arbitrator on behalf of the Council, does not appoint an arbitrator, the county court judge shall, on application of the Council, appoint such arbitrator on behalf of such owner.

(5) If the arbitrators so appointed fail within ten days to appoint a third arbitrator, such appointment shall be made by any judge of the Supreme Court on the application of any party.

11. (1) Any person whose property is injuriously affected by the making of a town planning scheme shall, if he makes a claim for the purpose within the time (if any) limited by the scheme, not being less than three months after the date when notice of the approval of the scheme is published in the manner prescribed by regulations made by the Council of such city, town or municipality, be entitled to obtain compensation in respect thereof from such city, town or municipality.

(2) A person shall not be entitled to obtain compensation under this section on account of any building erected on, or contract made or other thing done with respect to land included in a scheme, after the time at which the application for authority to prepare the scheme was made, or after such other times as the Council may fix for the purpose. Provided that this provision shall not apply as respects any work done before the date of the approval of the scheme, for the purpose of finishing a building begun, or of carrying out a contract entered into before the application was made.

12. (1) Where property is alleged to be injuriously affected by reason of any provisions contained in a town planning scheme, no compensation shall be paid in respect thereof if or in so far as the provisions are such as would have been enforceable if they had been contained in by-laws made by such city, town or municipality.

(2) Property shall not be deemed to be injuriously affected by reason of the making of any provisions inserted in a town planning scheme, which, with a view to securing the amenity of the area included in the scheme or any part thereof, prescribing the space about buildings or limiting the number of buildings to be erected, or prescribing the height or character of buildings, and which the Council of such city, town or municipality having regard to the nature and situation of the land affected by the provisions, consider reasonable for the purpose.

(3) Where a person is entitled to compensation under this Act in respect of any matter or thing, and he would be entitled to compensa-

tion in respect of the same matter or thing under any other enactment, he shall not be entitled to compensation in respect of that matter or thing, both under this Act and under that other enactment, and shall not be entitled to any greater compensation than he would be entitled to under the other enactment.

13. The Council of any city, town or municipality may, for the purpose of a town planning scheme, purchase any land comprised in such scheme by agreement, or be authorized to purchase any such land compulsorily in the same manner and subject to the same provisions as a city, town or municipality may purchase or be authorized to acquire land.

14. For the purpose of putting a scheme into effect in which it is proposed to erect buildings for housing purposes on any area planned under this Act, the Council of the city, town or municipality interested may cause a company to be formed, and for the purpose of encouraging the investment of loan capital in such company it may, on resolution of council, guarantee the bonds of said company, in whole or in part, provided said bonds do not exceed in value one half the capital required for the enterprise, including both land and improvements. And in case application is made by any company for authority to prepare a town planning scheme which shall include the erection of buildings for housing purposes, the Council of the city, town or municipality to which such application is made, may guarantee bonds that may be issued on account of such enterprise in the same manner as if it were itself to initiate a company for the purpose.

15. By the word "company" in the preceding section shall be understood any incorporated company or any co-operative mutual company organized for the purposes of the scheme.

New Brunswick

AN ACT RELATING TO TOWN PLANNING

(*Chap. 17, 2 Geo. V. Passed April 20, 1912*)

SECTION

1. (1) Town planning scheme; purpose.
- (2) Definition of terms "Local Authority" and "Government."
- (3) How town planning scheme is to be prepared.

SECTION

- (4) What "land likely to be used for building purposes" shall include; decision of Government final.
- (5) What Government may authorize included in town planning scheme.

SECTION

- (6) Scheme must be approved by order-in-council; proceedings to obtain approval.
- (7) Scheme may be varied or revoked; when and how.
- (8) Effect of approval by Government.
2. (1) "Responsible Authority" may be:—
- (a) The local authority applying, or
- (b) Where land is in the area of more than one local authority, either or both, or
- (c) A specially constituted body.
- (2) When a Commission may become the Responsible Authority.
- (3) Government may prescribe general provisions; purpose of.
- (4) Special provisions; when to be inserted in scheme; effect of.
- (5) Special provisions re procuring funds, etc.
3. (1) Government may make regulations re procedure, etc.
- (2) What provision shall be made by regulations.
4. (1) What the Responsible Authority may do after giving the notice required by scheme;
- (a) Remove, pull down or alter any building, etc.
- (b) Execute any work where delay would prejudice the operation of scheme.
- (2) Expenses incurred, how recovered.
- (3) How questions as to whether any building contravenes plan are to be settled.
5. (1) Claim by person whose property is injuriously affected for compensation.
- (2) When not entitled to obtain compensation; proviso.
- (3) When Responsible Authority is

SECTION

- entitled to claim for increase of value of property; amount of claim.
- (4) Questions under this Act as to injury or increase in value of property to be settled by arbitration.
- (5) How such amounts are to be recovered.
- (6) Compensation for expenses in case scheme is revoked.
6. (1) No compensation shall be paid when property is alleged to be injuriously affected.
- (2) When property shall not be deemed to be injuriously affected.
- (3) Amount of compensation where entitled under this Act and another enactment.
7. (1) Responsible Authority may purchase land required or expropriate under N. B. Railway Act.
8. (1) If Government is satisfied after public enquiry that a local authority:
- (a) Have failed to have scheme prepared where it ought to, or
- (b) Have failed to adopt a proposed scheme that ought to be adopted, or
- (c) Have unreasonably refused to consent to modifications, etc., the Government may approve scheme with modifications.
- (2) When Government may order Responsible Authority to execute all things necessary.
- (3) Order may be enforced by mandamus:

SCHEDULE A

Matters to be dealt with by general provisions prescribed by Government.

SCHEDULE B

Procedure anterior to and for the purpose of an application for authority to prepare or adopt a scheme.

BE it enacted by the Lieutenant Governor and Legislative Assembly, as follows:—

1. (1) A town planning scheme may be prepared in accordance with the provisions of this Act with respect to any land which is in the course of development, or is likely to be used for building purposes, with the general object of securing suitable provision for traffic, proper sanitary conditions, amenity and convenience in connection with the laying out of streets and use of the land and of any neighbouring lands for building or other purposes.

(2) The term "Local Authority" as hereinafter used in this Act, shall mean any City or Town Council of any regularly incorporated town or city, or the Municipal Council of any County in the Province of New Brunswick, and the term "Government," as hereinafter used in this Act, shall mean the Lieutenant-Governor-in-Council of the Province of New Brunswick.

(3) Any local authority may make application to the Government for authority to put into effect a town planning scheme, and the Government may authorize a Local Authority to prepare and put into effect a town planning scheme with reference to any land within or in the neighbourhood of the area over which it has municipal control, if the Local Authority satisfies the Government that there is a *prima facie* case for making such a scheme, or the Government may authorize a Local Authority to adopt, with or without modifications, any such scheme proposed by all or any owners of land, with respect to which the Local Authority might itself have been authorized to prepare a town planning scheme.

(4) The expression "land likely to be used for building purposes," shall include any land likely to be used as or for the purpose of providing open spaces, roads, streets, parks, pleasure or recreation grounds, or for the purpose of executing any work upon or under the land incidental to a town planning scheme, whether in the nature of a building work or not, and the decision of the Government as to whether land is likely to be used for building purposes, shall be final.

(5) The Government may authorize the inclusion in a town planning scheme of any land already built upon, or any land not likely to be used for building purposes, if it be made to appear to it that such land is so situated that it ought to be included, and may provide for the demolition or alteration of any buildings thereon, so far as may be necessary for carrying the scheme into effect.

(6) A town planning scheme, prepared or adopted by a Local Authority, shall not have effect, unless approved by order in council of the Government, and the Government may refuse to approve any such scheme, except with such modifications and subject to such conditions as they may think fit to impose; provided, that before a town planning scheme can be approved of by the Government, notice of intention to make application for its approval must have been published in the "Royal Gazette" of the Province, and if, within twenty-one days from the publication of such notice,

any interested person or authority files notice of objection in the prescribed manner, such objection shall be heard and adjudicated upon by the Government, or by such Board or Commission, as may be appointed by the Government for the purpose of hearing and adjudicating upon all matters of dispute which may arise between a Local Authority or a responsible authority, and other interested parties. In the event of objections being sustained by the Government or such Board or Commission as they may appoint for the purpose of adjudicating upon them no proceeding shall be taken toward carrying the scheme, as submitted, into effect, but this without prejudice to the preparation of a new or modified scheme covering the same area.

(7) A town planning scheme may be varied or revoked by a subsequent scheme, prepared or adopted by a Local Authority or a responsible authority, and approved by the Government, in accordance with the provisions of this Act.

(8) A town planning scheme, when approved by the Government, shall have effect as if it were specially enacted in this Act.

2. (1) The authority to be responsible for the carrying out of a town planning scheme, herein referred to as the "Responsible Authority" may be either.

(a) The Local Authority applying for approval of the scheme, or

(b) Where land included in a town planning scheme is in the area of more than one Local Authority, or is in the area of a Local Authority by whom the scheme was not prepared, the responsible authority may be one of those authorities, or for certain purposes of the scheme it may be one Local Authority, and for certain other purposes another Local Authority, or

(c) A body constituted specially for the purpose by the scheme, and all necessary provision may be made by the scheme for constituting such body and giving it the necessary powers and duties.

(2) For the purpose of preparing a town planning scheme and carrying the same into effect, a local authority, or the local authorities, where more than one is interested, may singly or jointly appoint a commission of not less than five or more than ten members, whose names shall be submitted to the Government when the draft scheme is presented for approval, and upon the approval by the Government of the scheme, and of the constitution of the commission named therein, the commission thus appointed shall

become the responsible authority for carrying the scheme into effect, to whom shall be delegated all the powers conferred by, and for the purpose of this Act upon the Local Authority.

(3) The Government may prescribe a set of general provisions (or separate sets of general provisions adapted for areas of any special character), for carrying out the general objects of town planning schemes, and in particular, for dealing with matters set out in the Schedule "A" attached to this Act, and the general provisions or separate sets of general provisions appropriate to the area for which the town planning scheme is made, shall take effect as part of every scheme, except so far as special provision is made by the scheme, as approved by the Government, for the variation or exclusion of any of these general provisions, and shall have the same effect as if specially enacted by the Legislature.

(4) Special provisions shall, in addition, be inserted in every town planning scheme, defining in such manner as may be prescribed by regulations under this Act, the area to which the scheme is to apply and the authority which is to be responsible for enforcing the observance of the scheme, and for the execution of any works which, under the scheme or under this Act, are to be executed by the Responsible Authority, and providing for any matters which may be dealt with by general provisions, and otherwise supplementing, excluding or varying the general provisions, and also dealing with any special circumstances or contingencies, for which adequate provision is not made in the general provisions, and for suspending, so far as necessary for the proper carrying out of the scheme, any enactments, by laws, regulations, or other provisions made by a Local Authority, which are in operation in the area included in the scheme, and such special provisions shall have the same effect as if specially enacted by the Legislature.

(5) Special provision shall also be made in every town planning scheme, defining the manner in which the funds necessary for carrying the scheme into effect are to be procured; provided, always, that no assessment upon any City, Town, Parish or County shall be authorized by any town planning scheme, without the consent of the Local Authority in control of the area affected, being first had and obtained; nor shall any power to borrow money, either by issue of bonds or otherwise, be conferred upon a responsible authority, by any town planning scheme, except with the approval of the local authority having municipal control of the area affected.

3. (1) The Government may make regulations for regulating generally the procedure to be adopted with respect to applications for authority to prepare or adopt a town planning scheme, the preparation of the scheme obtaining the approval of the Government to a scheme so prepared or adopted, and any inquiries, reports, notices or other matters required in connection with the preparation or adoption or the approval of the scheme or preliminary thereto or in relation to the carrying out of the scheme or enforcing the observance of the provisions thereof.

(2) Provision shall be made by these regulations:

(a) For securing co-operation on the part of the local authority, with the owners and other persons interested in the land proposed to be included in the scheme, at every stage of the proceedings, by means of conferences and such other means as may be provided by the regulations;

(b) For securing that notice of the proposal to prepare or adopt the scheme, should be given at the earliest stage possible to any parties interested in the land; and

(c) For dealing with the other matters mentioned in Schedule B to this Act.

4. (1) The responsible authority may, at any time after giving such notice as may be provided by a town planning scheme and in accordance with the provisions of this scheme:

(a) Remove, pull down, or alter any building or other work in the area included in the scheme, which is such as to contravene the scheme or in the erection or carrying out of which any provision of the scheme has not been complied with; or

(b) Execute any work which it is the duty of any person to execute under the scheme, in any case where it appears to any authority that delay in the execution of the work would prejudice the efficient operation of the scheme.

(2) Any expenses incurred by a responsible authority under this section, may be recovered from the persons in default, in such manner, and subject to such conditions as may be provided by the scheme.

(3) If any question arises whether any building or work contravenes a town planning scheme, or whether any provision of a town planning scheme is not complied with in the erection or carrying out of any such building or work, that question shall be referred to the Government or such Board as they may appoint for the purpose and, unless the parties otherwise agree, shall be

determined by the Government or such Board as arbitrators, and their decision shall be final and conclusive and binding on all persons.

5. (1) Any person, whose property is injuriously affected by the making of a town planning scheme, shall, if he makes a claim, not being less than three months after the date when notice of the approval of the scheme is published in the manner prescribed by regulations made by the Government, be entitled to obtain compensation in respect thereof from the responsible authority.

(2) Any person shall not be entitled to obtain compensation under this section on account of any building erected on, or contract made, or other thing done with respect to land included in a scheme, after the time at which the application for authority to prepare the scheme has been made, or after such other time as the Government may fix for the purpose;

Provided, that this provision shall not apply as respects any work done before the date of the approval of the scheme, for the purpose of finishing a building begun, or of carrying out a contract entered into before the application was made.

(3) Where, by the making of any town planning scheme, any property is increased in value, the responsible authority, if they make a claim for the purpose within the time (if any) limited by the scheme (not being less than three months after the date when notice of approval of the scheme is first published in the manner prescribed by regulations made by the Government), shall be entitled to recover from any person whose property is so increased in value one-half of the amount of that increase.

(4) Any question as to whether any property is injuriously affected or increased in value within the meaning of this section, and as to the amount and manner of payment (whether by instalments or otherwise), of the sum which is to be paid as compensation under this section, or which the responsible authority is entitled to recover from a person whose property is increased in value, shall be determined by the arbitration of a single arbitrator appointed by the Government, unless the parties agree on some other method of determination.

(5) Any amount due under this section as compensation to a person aggrieved from the responsible authority, or to a responsible authority from a person whose property is increased in value, may be recovered summarily as a civil debt.

(6) Where a town planning scheme is revoked by an order of the Government under this Act, any person who has incurred expenditure for the purpose of complying with the scheme, shall be entitled to compensation in accordance with this section, in so far as any such expenditure is rendered abortive by reason of the revocation of the scheme.

6.—(1) Where property is alleged to be injuriously affected by reason of any provisions contained in a town planning scheme, no compensation shall be paid in respect thereof, if, or so far as the provisions are such as would have been enforceable if they had been contained in by-laws made by the local authority.

(2) Property shall not be deemed to be injuriously affected by reason of the making of any provisions inserted in a town planning scheme which, with a view to securing the amenity of the area included in the scheme, or any part thereof, prescribe the space about buildings or limit the number of buildings to be erected, or prescribe the height or character of buildings, and which the Government, having regard to the nature and situation of the land affected by the provisions, consider reasonable for the purpose.

(3) Where a person is entitled to compensation under this part of this Act, in respect to any matter or thing, and he would be entitled to compensation in respect to the same matter or thing, under any other enactment, he shall not be entitled to compensation in respect to that matter or thing, both under this Act, and under that other enactment, and shall not be entitled to any greater compensation under this Act than he would be entitled to under the other enactment.

7. (1) The responsible authority may, for the purpose of a town planning scheme, purchase any land comprised in such scheme, by agreement, or be authorized to purchase any such land compulsorily, in the same manner and subject to the same provisions as are contained in Section 17, "The New Brunswick Railway Act."

8. (1) If the Government is satisfied, on any representation, after holding a public inquiry, that a local authority.

(a) Have failed to take the requisite steps for having a satisfactory town planning scheme prepared and approved, in a case where a town planning scheme ought to be made; or

(b) Have failed to adopt any scheme proposed by owners of any land, in a case where the scheme ought to be adopted, or

(c) Have unreasonably refused to consent to any modifications or conditions imposed by the Government, the Government may, as the case requires, order the local authority to prepare and submit for its approval, such a town planning scheme, or to adopt the scheme, or to consent to the modifications or conditions so inserted;

Provided, that where the representation is that a local authority have failed to adopt a scheme, the Government, in lieu of making such an order as aforesaid, may approve the proposed scheme, subject to such modifications or conditions, if any, as the Government think fit, and thereupon the scheme shall have effect as if it had been adopted by the local authority and approved by the Government.

(2) If the Government is satisfied, on any representation, after holding an inquiry, that a responsible authority has failed to enforce effectively the observance of the scheme which has been confirmed, or any provisions thereof, or to execute any works which, under the scheme or this Act, the authority is required to execute, the Government may order that authority to do all things necessary for enforcing the observance of the scheme or any provisions thereof effectively, or for executing any works which, under the scheme or this part of this Act, the authority is required to execute.

(3) Any order under this section may be enforced by mandamus.

SCHEDULE A

Matters to be dealt with by General Provisions Prescribed by the Government

1. Streets, roads and other ways, and stopping up, or diversion of existing highways.
2. Buildings, structures and erections.
3. Open spaces, private and public.
4. The preservation of objects of historical interest or natural beauty.
5. Sewerage, drainage, and sewage disposal.
6. Lighting.
7. Water supply.
8. Ancillary or consequential works.
9. Extinction or variation of private rights of way and other easements.
10. Dealing with or disposal of land acquired by the responsible authority or by a local authority.

11. Power of entry and inspection.
12. Power of the responsible authority, to remove, alter, or demolish any obstructive work.
13. Power of the responsible authority to make agreements with owners, and of owners to make agreements with one another.
14. Power of the responsible authority or a local authority to accept any money or property for the furtherance of the objects of any town planning scheme, and provision for regulating the administration of any such money or property.
15. Application with necessary modifications and adaptations of statutory enactments.
16. Carrying out and supplementing the provisions of this Act for enforcing schemes.
17. Limitation of time for operation of scheme.
18. Co-operation of the responsible authority with the owners of land included in the scheme, or other persons interested by means of conferences, etc.
19. Charging on the inheritance of any land, the value of which is increased by the operation of a town planning scheme, the sum required to be paid in respect of that increase, and for that purpose, applying with the necessary adaptations, the provisions of any enactments dealing with charges for improvements of land, or making special provisions to govern the same.

SCHEDULE B

1. Procedure anterior to and for the purpose of an application for authority to prepare or adopt a scheme:—
 - (a) Submission of plans and estimates.
 - (b) Publication of notices.
2. Procedure during, on, and after the preparation or adoption and before the approval of the scheme:—
 - (a) Submission to the Government of the proposed scheme, with plans and estimates.
 - (b) Notice of submission of proposed scheme to the Government.
 - (c) Hearing of objections and representations by persons affected, including persons representing architectural societies or otherwise interested in the amenity of the proposed scheme.
 - (d) Publication of notice of intention to approve scheme and the lodging of objections thereto.
3. Procedure after the approval of the scheme:—

(a) Notice to be given of approval of the scheme.

(b) Inquiries and reports as to the beginning and the progress and completion of works and other action under the scheme.

4. Duty, at any stage, of the local authority, to publish or deposit for inspection, any scheme, or proposed scheme, and the plans relating thereto, and to give information to persons affected with reference to any such scheme or proposed scheme.

5. The details to be specified in plans, including, wherever the circumstances so require, the restrictions on the number of buildings which may be erected on each acre, and the height and character of those buildings.

Ontario

AN ACT RESPECTING SURVEYS AND PLANS OF LAND IN CERTAIN CITIES AND THEIR SUBURBS*

(Chap. 43, 2 Geo. V.)

HIS MAJESTY, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:—

1. This Act may be cited as *The City and Suburbs Plans Act*.

2. Where any person is desirous of surveying and subdividing, into lots with a view to the registration of a plan of the survey and subdivision, any tract of land lying within or within five miles of a city, having a population of not less than 50,000, he shall submit a plan of the proposed survey and subdivision to "The Ontario Railway and Municipal Board" for its approval.

3.—(1) The Board shall have authority before approving of the proposed plan to require such changes to be made in it as the Board may deem proper as to:—

(a) The number and width of the roads or streets;

(b) The direction in which the roads and streets are to run and their location; and

(c) The size and form of the lots.

(2) Nothing in clause (a) shall authorize the laying out of any road or street, less than 66 feet in width.

* This Act does not go far enough: it is only applicable to cities of 50,000 population and over, and, therefore becomes operative only when most of the errors in town planning have been committed and are most expensive to remedy. It also places a limitation upon the area to be planned irrespective of the direction of the city's growth.—C.A.H.

4. In determining as to the suitability of the proposed plan, or as to the desirability of any change in it, the Board where the land lies within the city shall have regard to making the subdivision and roads and streets and their location and width, and the direction in which they are to run, conform as far as practicable with any general plan which has been adopted or approved by the council of the city in accordance with which it is contemplated that the city and suburbs shall be laid out or the re-arrangement of the streets and thoroughfares shall be effected, and where the land is situate without the limits of the city, the Board shall have regard to

- (a) The proximity of the land to the city;
- (b) The probability of the limits of the city being extended so as to include it;
- (c) The securing of driveways and adequate thoroughfares connecting the city and the outlying districts;
- (d) Making the subdivision and the roads and streets and their location, and width, and the direction in which they are to run, conform as far as practicable with any plan so adopted or approved or if no such plan has been adopted or approved with the plan on which that part of the city which lies nearest to the land is laid out.

5. No plan of any such land shall be registered unless it has been approved by the Board and a certificate of its approval, signed by the Chairman or a member of the Board or the Secretary is endorsed on the plan, and no lot laid down on a plan, not so approved shall be sold or conveyed by a description containing any reference to the lot as so laid down or to such plan.

6.—(1) Notice of an application to the Board for its approval of a plan, shall be given to the corporation of the municipality in which the land is situate and to the corporation of the city, and all parties interested shall be entitled to be heard, and may be represented by counsel at the hearing of the application.

(2) A copy of the plan shall accompany such notice.

7.—(1) Objections to the plan shall be stated in writing and be filed with the Secretary of the Board within 21 days after delivery of the notice and plan.

(2) If no objection is made within that period the applicant shall be entitled to have the plan certified as approved, unless the Board of its own motion shall have otherwise directed.

8. Sittings of the Board shall, if required by the Council or Municipality objecting to the plan, take place at such time and place in the City nearest to the land, as the Board, by notice to the applicant and to the Clerk of the Municipality requesting the same, appoints.

II. Protection of Birds in the United States

AN ACT TO PROTECT MIGRATORY GAME AND INSECTIVOROUS BIRDS IN THE UNITED STATES

(1912)

BE it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

1. That all wild geese, wild swans, brant, wild ducks, snipe, plover, woodcock, rail, wild pigeons, and all other migratory game and insectivorous birds which in their northern and southern migrations pass through or do not remain permanently the entire year within the borders of any State or Territory, shall hereafter be deemed to be within the custody and protection of the Government of the United States, and shall not be destroyed or taken contrary to regulations hereinafter provided therefor.

2. That the Department of Agriculture is hereby authorized and directed to adopt suitable regulations to give effect to the previous paragraph by prescribing and fixing closed seasons, having due regard to the zones of temperature, breeding habits, and times and line of migratory flight, thereby enabling the department to select and designate suitable districts for different portions of the country, and it shall be unlawful to shoot or by any device kill or seize and capture migratory birds within the protection of this law during said closed seasons, and any person who shall violate any of the provisions or regulations of this law for the protection of migratory birds shall be guilty of a misdemeanour and shall be fined not more than \$100 or imprisoned not more than ninety days, or both, in the discretion of the court.

3. That the Department of Agriculture, after the preparation of said regulations, shall cause the same to be made public, and shall allow a period of three months in which said regulations may be examined and considered before final adoption, permitting, when deemed proper, public hearings thereon, and after final adoption shall cause

the same to be engrossed and submitted to the President of the United States for approval: *Provided, however*, That nothing herein contained shall be deemed to affect or interfere with the local laws of the States and Territories for the protection of nonmigratory game or other birds resident and breeding within their borders, nor to prevent the States and Territories from enacting laws and regulations to promote and render efficient the regulations of the Department of Agriculture provided under this statute.

4. That there is hereby appropriated, out of any moneys in the Treasury not otherwise appropriated, for the purpose of carrying out these provisions, the sum of ten thousand dollars.

III. Natural Resources of the North Shore, Gulf of St. Lawrence*

THE rivers surveyed this summer flow into the gulf of St. Lawrence between Eskimo Point and Natashkwan, and lie almost entirely in the "Seigneurie de Mingan," which extends from St. John river to Agwanus river.

The survey had to be made when the water was low, and, in this connection, I was favoured by circumstances, the stage of the rivers being lower in that season than it had been for many years. In keeping with my instructions, I measured the flow of each river at one point only.

Method of Working The party, besides myself, was composed of two civil engineering students, Mr. Perron, a third-year man and Mr. Levesque, a first-year man. On reaching the water-power to be measured, we generally portaged our canoe to the head of the fall and ascended a short distance in order to choose the most convenient point for work. When this was selected, a rope was stretched across the river and meter readings taken at intervals of ten feet. At each of these points three readings were taken, one a foot and a half from the bottom, one in the middle, and another two feet from the surface. The gauging completed, stadia work was usually done in connection with the water-power and the surroundings.

* This report was made by Mr. A. O. Beauchemin, District Engineer of the Department of Public Works at Chicoutimi, and is dated Dec. 5, 1911. Through the kindness of the Department of Public Works, Mr. Beauchemin was permitted to devote a portion of his time to this work, the expenses in connection therewith being borne by the Commission of Conservation.

Romaine
River

Late in July, we started for the two large water-powers of the Romaine river, which runs parallel to the coast line of the gulf of St. Lawrence for a distance of fifteen miles, emptying into the gulf eighteen miles west of Eskimo Point. There are three important water-powers in this river. The first, called locally Eglise chute, is ten miles distant from the mouth of the river and five miles from Eskimo Point wharf. We did not stop to gauge this water-power, as we intended to do so on our way back. Ascending the river, we encountered two other falls, one twenty-one miles and the other thirty-five miles from the mouth. The latter fall has a head of ninety feet and is capable of generating a considerable amount of power. The Romaine river is twelve hundred feet to one mile wide, and has a current of considerable velocity. Unfortunately, it was not possible to meter the flow as the current was so strong that our rope broke several times in attempting to stretch it across. We intended going back in September, when the stage of the river would be lower, but found it impossible to do so, owing to the pressure of other work.

The banks of the river are thickly covered with spruce, jack-pine and fir, ranging from seven to twelve inches in diameter. Quantities of iron sand are found along the shores. Owing to its numerous falls and rapids, the river is not navigable, but, on the other hand, its water-powers and the timber along its banks are of industrial importance.

Eskimo Point, a village with a population of about 1,000 has a good natural harbour. Between Romaine river and the coast, the ground is level and presents no obstacles to railway construction. The largest ships can call at Eskimo Point wharf.

Victor and
Corneille
Rivers

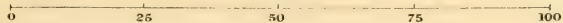
On the 15th of August, we left for our second trip on which we intended ascending all the rivers between Eskimo Point and Natashkwan, a distance of eighty-three miles. Corneille bay was reached on the evening of August 17. The conditions had been exaggerated by our guide, who said there was a fall there of 25 to 30 feet. As a matter of fact, there was only about two feet of water in the river, and the current was not even strong enough to move the meter.

Similar conditions were found on the Victor river. I am certain, however, that the flow of these rivers is considerable during the high-water seasons. The lumber along the banks is of good quality, but the quantity is very limited.

Little
Piasht
River

The mouth of this river is 35 miles east of Eskimo Point, at the head of a large bay which affords a splendid harbour for moderate-sized vessels. At low-tide, the river

Scale



forms a rapid at the mouth, but at high-tide it is on a level with the sea. A small village, bearing the name of the river is situated on the east shore. Mr. J. Beetz, a Belgian who lives here, has undertaken silver fox and black fox farming on a large scale. He employs twelve families the year round.

Little Piashti river is not navigable, being tortuous, shallow and rocky. For a distance of three miles, it is four hundred feet wide, after which it narrows down to between eighty and a hundred feet for a distance of half a mile, when a series of rapids is met. The height of the fall is 110 feet, the descent being gradual. It could easily be developed and would produce, according to the gauge reading, 3,125 horse-power. The river was very low when the reaching was taken, the flow being only 249 cubic feet per second.

Timber is scarce along this river. I was shown two fine specimens of orthoclase feldspar found in this district. Fish is abundant: trout and salmon especially are plentiful.

Piashti River This stream flows into the gulf of St. Lawrence, 38 miles east of Eskimo Point, at the end of a large inlet which is about a mile and a half long and half a mile wide. The inlet affords a safe harbour, even for large ships.

On the south-eastern point of the bay are feldspar mines, discovered by Mr. McKenzie and now the property of a company. There is said to be a considerable quantity of pure mineral, but, the mine being situated in the seigneurial domain of Mingan, the land owners contend that it belongs to them; on the other hand, the company, having obtained titles from the Quebec Government, claims it has the right to operate them. The case is now pending in court.

Two falls close together and situated about two miles from the mine are found in this river. The discharge observed was 901 cubic feet per second and the total head of the two falls 70 feet, which would give 7,150 horse-power. The falls are both vertical pitches; the height of the first is 61.83 feet, and of the second, 8.17 feet. At the head of these falls the river has an average width of from 150 to 200 feet. That portion of the coast is very thickly covered with spruce, jack-pine and fir, suitable for pulpwood. No other fall on the coast seems adapted for easy development.

Watshishu River This river is on the north shore of the gulf of St. Lawrence, about 420 miles from Quebec and 44 miles from Eskimo Point.

The harbour is one and a half miles east of the river and the islands scattered at its mouth are rich in feldspar, large veins running through the quartz formation. Hunters from the locality showed me fine specimens of orthoclase feldspar, stating that they had been found a few rods away from the shore, but I was unable to examine the deposits.

In the first three miles from its mouth, the river is broken by five rapids, and a mile and half farther on, is the first important fall, which is 19.75 feet in height and pitches vertically. At this point, the river divides into two branches, the western, 45 feet wide, and the eastern, 60 feet. The fall, which could be developed for power purposes, would develop 1,230 horse-power. At the time the measurements were made, the discharge was 550 cubic feet per second.

The second important fall is three miles distant from the first, or seven miles from the sea. It is separated from the first by a lake three miles long. This fall is almost vertical; its height is 50 feet and the total flow at the time measurements were taken, was 550 feet per second, giving 3,115 horse-power. It could be economically developed for power purposes.

No timber is found on the first five miles along the shores, but there is pulpwood farther up.

Agwanus River This river is on the north shore of the gulf of St. Lawrence, about 460 miles from Quebec and 62 miles east of Eskimo Point. Its mouth forms a large bay, about one mile long and one and a half mile wide. The entrance is dangerous, particularly with a west wind. The width of the river is 150 feet. Its bed, on the western side, is composed of sand carried down the river, but on the eastern side it is very rocky, the rocks advancing far out into the sea. The water of the bay is shallow and sand bars are uncovered at low-tide, there being only two fathoms of water at the mouth.

The river falls into the north-western part of the bay; it is about 500 feet wide and has a descent of about 10 feet at low-tide. This fall could not be developed, as the banks are low and the head at high-tide is reduced to 4 or 5 feet. Three miles farther up, there is a second fall. The river, which is about a mile wide up to this point, narrows down to 300 or 400 feet above the fall, where a rocky island divides it into two parts. The eastern arm descends gradually over a distance of 400 or 500 feet, while the western arm, which is narrower, pitches almost vertically, with a fall of 27.23 feet. The discharge was 4,713 cubic feet per second which would give 1,580 horse-power. This water-power might easily be developed. Timber, however, is very scarce along the banks of the river.

Natashkwan River The Natashkwan, one of the largest rivers of this region, is on the north shore of the gulf of St. Lawrence.

It is 480 miles from Quebec, and empties into the gulf four miles south of the village of Natashkwan. It is about one mile wide for a distance of five miles from its mouth; thence it gradually narrows down to 600 or 700 feet over the next seven miles, when the first fall is reached. A number of shifting sand bars, scattered over a distance of four miles, make navigation hardly practicable along this part of the river. The banks are very steep and have magnetic sand deposits in horizontal layers about three inches thick.

On the south point of the mouth of the river are found the well-known iron-sand deposits, which in places, show a depth of nine feet, and contain up to 56 per cent of magnetic sand. This summer, a metallurgist from the Dominion Department of Mines spent some weeks in this locality examining these deposits, and took away ten tons of the sand to be tested in an electric furnace. Close to these deposits are valuable peat bogs, ten feet deep. Peat is found in large quantities all along the coast from Eskimo Point to Natashkwan.

The first fall not being very important, we did not measure it; the descent is only eight to ten feet and very gradual. The second fall, fourteen miles from the mouth of the river, is a fine water-power. The river is divided into two branches by a rocky island; the east branch has a gradual descent, while the west branch pitches almost vertically with a fall of 18.38 feet. The flow was measured as 9,092.8 cubic feet per second, giving 18,930 horse-power. This fall could be easily developed.

The third fall, two miles farther up, is 400 feet wide, but, when we measured the flow, the water was very low and a portion of the fall had dried up. At that time, the fall was about 300 feet wide with a gradual descent of 45 feet; the flow was 9,092 cubic feet per second, giving 46,340 horse-power. This fall could easily be developed.

The timber along this river is of very fair size and is of good quality, particularly above the fourth fall. Some of the timber used in the Natashkwan wharf, measuring from 12 to 14 inches in diameter, has been cut along this river.

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